EXAMINATION OF MATERNAL LANGUAGE STRATEGIES DURING BOOK SHARING WITH INFANTS AND TODDLERS FROM LOW INCOME AND RURAL ENVIRONMENTS

Linzy Abraham

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Speech and Hearing Sciences in the Department of Allied Health Sciences.

Chapel Hill
2007

Approved by:

Elizabeth Crais
Karen Erickson
Lisa Hammett-Price
Lynne Vernon-Feagans
David Yoder

ABSTRACT

LINZY ABRAHAM: Examination of Maternal Language Strategies during Book Sharing with Infants and Toddlers from Low Income and Rural Environments
(Under the direction of Elizabeth Crais)

Research indicates that maternal language plays a crucial role in children's communication development, however, less is known about the relationships between maternal language use and children's early communication abilities within families from low income and rural environments. In order to better understand these relationships the current study examined the structure and content of mothers' language use when children were 6 months of age and again when the children were 15 months of age, within a sample of 82 mothers and their children who were living in low income, rural environments. Maternal language use was documented during book sharing interactions within the home at each time point, and information regarding children's communication abilities was obtained at the 15 month time point. The main aims of the investigation were to identify whether differences occurred in maternal language use across the two time points and to analyze the potential relationships between mothers' language use and children's early communication abilities. Among mother-child dyads there was a great deal of variability in maternal language use and in the duration of book sharing interactions within time points. In addition, significant differences in both the structure and content of mothers' language were evident between the 6 and 15 month time points. Analyses also identified a significant predictive relationship between mothers' rate of use of specific language strategies and children's symbolic communication abilities. These findings emphasize the potential importance of mothers' use

of language strategies that provide greater elaborated or abstract content. The results highlight the heterogeneity in the sample and demonstrate the utility of obtaining various measures of maternal language to more fully describe their interactions with their children, as only certain aspects of maternal language use were significant predictors of children's communication outcomes. Further, the current investigation reveals the value in examining children's early communication development within families who live in low income, rural environments.

ACKNOWLEDGEMENTS

The completion of this dissertation would not have been possible without the guidance and encouragement of many people. In particular, I would like to thank my primary advisor, Betsy Crais, who has played a crucial role over the years in both my academic and professional career. Most recently she has helped me develop as a researcher and writer, "scaffolding" the process with her suggestions and feedback. I would also like to thank Karen Erickson, Lisa Hammett-Price, Lynne Vernon-Feagans, and David Yoder, who were also members of my dissertation committee. These individuals have willingly shared their expertise and time, allowing me to improve my analytical skills, my writing abilities, and extend my learning.

In addition, I am grateful to the Executive Committee and investigators of the Family Life Project, who gave me permission to utilize data from their extensive study of families and children. Specifically, I have appreciated the resources and materials made available by Lynne Vernon-Feagans and her research team, including obtaining transcripts, assistance with statistical analysis, and obtaining reliability with my coding system.

Finally, I would like to thank my friends and family. Without their optimism and enthusiasm, it would not have been possible to sustain the effort needed to complete this dissertation. My parents, sister, and extended family members have been a constant source of encouragement and have always believed in me. I would especially like to thank my husband, Jawahar, for his support of this academic program over the past several years. His

ongoing confidence in my abilities and his willingness to assist me throughout this entire process has allowed me to achieve this goal

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

CHAPTER 1: INTRODUCTION

The aims of the current study were to examine maternal language use with young children from low income and rural environments across two time points in early development and identify possible relationships between maternal language use and children's communication abilities. In order to achieve these purposes, this investigation documented specific aspects of mothers' language use during book sharing interactions with their children at the 6 and 15 month time points, and measured children's communication abilities at the 15 month time point. These characteristics of maternal language were compared across the time points and in addition, potential relationships between maternal language use and children's communication were analyzed.

Statement of the Problem

Language development has been examined for a number of years, with recent research focused on the contributions of caregivers to their children's language development. This research has incorporated theories of child development that suggest that language acquisition, like other aspects of development, is a transactional process influenced by multiple ecological factors, including culture, home environment, along with caregiver and child characteristics (Bronfenbrenner & Morris, 1998; Chapman, 2000; Sameroff & MacKenzie, 2003). Additionally, the interactions between caregivers and their children have been posited as important mechanisms in language learning (Rogoff, 1990; Vygotsky, 1978). Much of the research specific to language development, however, has been based on studies involving small groups of children, or case studies (e.g. Bates, Camaioni, & Volterra, 1975;

Bloom, 1973; Bruner, 1975; Carpenter, Mastergeorge, & Coggins, 1983; Ninio & Bruner, 1978). Additional research is necessary that incorporates a greater number of participants and a longitudinal design to provide a more detailed examination of caregivers and children over time. Furthermore, most studies have been based on families with middle-class socioeconomic status and those who live in urban areas (e.g. Carpenter, Nagell, & Tomasello, 1998; Ninio & Bruner, 1978), with less known about these processes within families who have lower incomes and who are from rural environments. Due to the limited research available about these families, analyzing interactions within a sample of families from low income and rural environments will offer important information regarding these caregivers' language use and the contributions they may make to their children's language development.

Understanding early language development is essential, as children's early language abilities have positive relationships with later language and literacy skill development (NICHD Early Child Care Research Network, 2005a). In particular, there is some evidence that children from lower income environments may be at a higher risk for later language difficulties (NICHD Early Child Care Research Network, 2005b). Young children who display difficulties with language learning are more likely to experience difficulties in acquiring literacy skills needed upon school entry (Catts, Fey, Tomblin, & Zhang, 2002). By investigating factors that promote children's communication development from an early age, such as caregiver language use, it may be possible to minimize later language and literacy difficulties especially in children who may be at greater risk.

In order to examine caregivers' language use, this study provides a detailed description of mothers' language use with their children, at both the 6 and 15 month time

points, during book sharing interactions. In doing so, it offers a way to identify possible differences in maternal language at the two time points. Further, to consider the influence of caregivers' language use on children's communication, this study analyzes the potential relationships between the characteristics of mothers' language use at both time points and children's communication abilities at the 15 month time point.

Children's Early Communication Development

Children's communication develops within social interactions that occur with other individuals (Bruner, 1981; Carpenter et al., 1998). During the latter part of their first year, children typically develop communicative intent and begin demonstrating their communication abilities through the use of gestures, sounds, and words (Carpenter et al., 1998; Wetherby, Cain, Yonclas, & Walker, 1988). In their second year of life, children are able to express an increased variety of communicative functions, with an expanded repertoire of communicative means (Bates et al., 1975; Wetherby et al., 1988). As children are active in their development, their abilities can influence the input that they receive. Although they may have limited communicative participation earlier in their first year, by the beginning of their second year, children's communication during interactions may have an influence on caregivers' language use (McLean, 1990; Sameroff & MacKenzie, 2003). Therefore, it is useful to examine children's communication development from infancy, and document the potential for changes in caregivers' language use over time. The longitudinal nature of the current study allows for the description of maternal language use during book sharing interactions at the 6 and 15 month time points and the analysis of possible differences in mothers' language use across the two time points. By beginning the current investigation when children are 6 months of age, it is possible to examine mothers' language use at this

time point with minimal communicative participation from the children and then again later when the children are more active communicators.

Caregiver Language Use

Investigations of caregivers' language use are important because there is evidence that their language actively influences children's language acquisition (e.g. Bruner, 1981; Rogoff, 1990; Rollins, 2003; Vygotsky, 1978). Vygotsky (1978) suggests that children acquire new abilities when they are engaged in interactions with more capable others. These more capable others push children beyond the goals they can achieve independently and "scaffold" communicative interactions, in order to support and facilitate communication between the child and themselves (Bruner, 1981). For most young children, parents serve as these more competent individuals who encourage their children's development through social interactions.

There have been various approaches to examining caregivers' language use in relation to children's language development. Some investigations have focused on the structural elements of maternal language such as the amount of talk, the diversity of vocabulary, and the complexity of speech (Hart & Risley, 1995; Hoff & Naigles, 2002; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). In particular in several studies, parents' amount of talk has been related to children's later vocabulary development (Barnes, Gutfreund, Satterly, & Wells, 1983; Hart & Risley, 1995; Huttenlocher et al 1991). Additionally, parental vocabulary diversity, as measured by the number of different words used, is related to children's growth in expressive vocabulary and some measures of their verbal comprehension (Bornstein, Haynes, & Painter, 1998; Hart & Risley, 1995; Pan, Rowe,

Singer, & Snow, 2005). Similarly, parental utterance length and syntax has been related to children's vocabulary outcomes (Hoff & Naigles, 2002).

In contrast, other research has focused on the content of caregivers' language by observing the techniques they use to model language, their style/responsiveness, or their use of language strategies (e.g. Baumwell, Tamis-LeMonda, & Bornstein, 1997; Hardy-Brown & Plomin, 1985; Kavanaugh & Jirkovsky, 1982; Rollins, 2003). There are a variety of specific techniques that caregivers use in order to model language and participation. For example, some caregivers imitate their children's vocalizations, or use words to express their child's nonverbal action (Hardy-Brown & Plomin, 1985; Yoder, Warren, Kim & Gazdag, 1994). These individual techniques and others are positively related to children's expressive vocabulary (Yoder, McCathren, Warren, & Watson, 2001); however, caregivers often use a combination of these techniques during interactions and it is likely the use of multiple techniques supports children's language development.

Another way to document caregivers' use of multiple techniques is to describe their style of interaction or their responsivity. Caregivers' style of interaction seems to have an influence on children's communication, with positive relationships observed between a facilitative style and a variety of children's language outcomes (Baumwell et al., 1997; Fewell & Deutscher, 2004; Hockenberger, Goldstein, & Haas, 1999; Karrass, Braungart-Rieker, Mullins & Lefever, 2002). However, caregiver behaviors that restrict children's actions have possible negative consequences for children's vocabulary learning (Masur, Flynn, & Eichorst, 2005; Tomasello & Farrar, 1986). Additionally, maternal responsivity has been linked with children's expressive language skills, with different aspects of maternal responsivity relevant at specific points in development (Bornstein, Tamis-LeMonda, &

Haynes, 1999; Tamis-LeMonda, Bornstein, & Baumwell, 2001). Finally, by documenting caregivers' use of language strategies, it is possible to describe the specific purpose of each utterance. These language strategies may also be classified based on the concrete or abstract content within the utterance. The number and types of language strategies used by caregivers have also been related to children's language development (DeTemple, 2001; Roberts, Jurgens, & Burchinal, 2005; van Kleeck, Gillam, Hamilton, & McGrath, 1997).

Both the structure and content of mothers' language use are addressed in the current investigation, extending the literature on maternal talk during book sharing with young children. Specifically, by incorporating measures of the structure of maternal talk and by identifying language strategies in maternal utterances, the current investigation provides a detailed perspective on maternal language use with their children at the 6 and 15 month time points. Additionally, the current study analyzes the contributions of these multiple aspects of maternal language use to children's early communication abilities.

Factors Influencing Development

Recognizing that caregivers' language use and children's development are influenced by a variety of environmental factors (Bronfenbrenner & Morris, 1998), it is important to account for these factors through study design or analytical methods. For the current study, the factors of maternal education and family income level were of particular interest. These factors have positive relationships with maternal language use and have also been associated with children's developmental outcomes (Dollaghan et al., 1999; Duncan & Brooks-Gunn, 2000; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Rowe, Pan, & Ayoub, 2005). In particular, mothers with higher levels of education and income use more diverse, complex language and have children who display better communication skills (Dollaghan et al., 1999; Hart &

Risley, 1995; NICHD Early Child Care Research Network, 2005b). Thus, in the current sample, mothers' education level and the family income were utilized as control variables in several analyses. Moreover, to examine the variability present within a sample of families with low incomes and from rural environments, the randomly selected families in the current study had incomes below twice the federal poverty level and lived in rural areas of Pennsylvania.

Finally, there are additional factors that influence caregivers' language use such as children's age or ability, as well as the social context of the interaction (Bronfenbrenner & Morris, 1998; Bruner, 1981; Chapman, 2000; Rogoff, 1990; Sameroff & MacKenzie, 2003; Vygotsky, 1978). Parents have also been reported to adjust their language with their children, using less complex language during interactions with younger children, and producing more sophisticated language with older children (DeLoache & DeMendoza, 1987; DeTemple, 2001). Further, parents at times modify their talk based on their perception of their children's developmental ability (Pellegrini, Perlmutter, Galda, & Brody, 1990; van Kleeck et al., 1997). By investigating mothers' language use at two time points in early development, this study provides documentation of potential differences in maternal language that may be related to children's ages.

When considering the role of social context, research supports the use of book sharing as one context that fosters early language and literacy development in young children (e.g. Bus, van IJzendoorn, & Pellegrini, 1995; Sénéchal, 1997; van Kleeck et al., 1997). Existing research, however, has focused mainly on children who are above the age of 3 years and who live within families from middle-class or upper-middle class environments. In comparison, there are a small number of studies examining caregivers' language use with their very young

children across early time points in development, and few studies involving participants from low income and rural environments. Moreover, there are limited book sharing investigations that have accounted for caregivers' education level as well as their income, as separate environmental factors. Therefore, book sharing research that is able to account for income and education, as well as include typically under-represented participants, as this study does, will add to the research literature.

Summary

Although there is evidence supporting the crucial role that caregivers play in children's communication development, past research has been limited by cross-sectional designs, the developmental time periods examined, and the restricted participation of individuals from low income, rural environments. The current investigation will address these issues by utilizing a longitudinal design, involving mothers and their young children at two time points in early development, and selecting participants from low income and rural environments. In particular, this study examines mothers' language use with their young children during a book sharing interaction, first when children are 6 months and later at 15 months of age. The current study is part of a larger, ongoing research effort, the Family Life Project, examining child development in rural areas. Specifically, the current investigation analyzed differences in maternal language use between the 6 month and 15 month time points. It also considered potential relationships between maternal language use at both time points and children's communication abilities at the 15 month time point. This research extends the previous book sharing literature by examining maternal language with young infants and toddlers using a longitudinal design. Further, the study offers a unique

opportunity to analyze maternal language and children's communication in families from low income and rural environments.

CHAPTER 2: REVIEW OF THE LITERATURE

Characteristics of Early Communication in Young Children

Children acquire communication abilities within social interactions that begin from birth (Bruner, 1981; Bates et al., 1975). As newborns, infants display reflexes that encourage interactions, such as crying due to hunger or discomfort, and attending to visual or auditory signals. Around the age of 2-3 months, infants begin to produce more varied signals, including smiling and vocalizations described as "cooing" or "gooing" (Stoel-Gammon, 1998). Infants produce these early sounds in the context of face-to-face interactions with their caregivers. During these exchanges adults may pause and listen for a vocalization from the infant, and subsequently respond to any vocal production, introducing infants to the early turn-taking routines of conversation. The infants' early vocal sounds consist predominately of vowel sounds, but around 4-6 months, infants begin to expand their repertoire of vocal sounds to include early sequences of consonants and vowels. In the next phase of vocal development, at 6-7 months, infants begin babbling, producing consonant-vowel combinations in repeated (e.g. bababa) and varied syllable sequences (e.g. madaga; Stoel-Gammon, 1998). The amount of varied syllable babbling increases after 9-10 months and at around 12 months children begin producing more complex strings of sounds with varied intonation and stress patterns. At this point children are often described as using "their own language". Although children may start using single words around 12-13 months, there is a great deal of variation in both the age that children begin using single words and the acquisition rate of the initial productive vocabulary (Fenson et al., 1993).

While children increase their proficiency in vocal ability, they also typically develop their awareness of communicative intent and the effect their actions may have on others. Bates et al. (1975) describe three phases in the onset of intentional communication: (a) the perlocutionary stage, (b) the illocutionary stage, and (c) the locutionary stage, which follow a general sequence in early development. During the perlocutionary stage, the infant produces actions that have a systematic effect on the listener, without self-awareness of this effect. Children who display perlocutionary acts are typically less than 8 months of age. Although the actions and vocalizations produced by the infant typically are not intentional, caregivers often attribute meaning to these behaviors, and by responding begin teaching early functions of communication. Infants around the age of 8-9 months, however, begin displaying an awareness of communicative intent and its effect, and use gestures and vocalizations to communicate with others, thereby entering the illocutionary stage. The locutionary stage, evident around the age of 12-13 months, can be characterized by the child's use of words or symbols for specific purposes. As there have been varying views on the behaviors that signal development from perlocutionary to illocutionary stages, Wetherby & Prizant (1989) suggest that communicative intentionality be considered along a developmental continuum as an alternative to a more discrete stage model. In their view, the typical child progresses from no awareness of a goal in infancy, to a more sophisticated ability in later childhood to reflect and verbalize about their strategies to achieve a goal.

Children's development in communication is also evidenced by an increase in their rate of production of communicative acts. Wetherby et al. (1988) describe the communication levels of children in their study as prelinguistic (not consistently using single words for communicative purposes), one-word (using single words for communication), and

multiword (using at least two words in combination for communication). Specifically, children who are at the prelinguistic level of development (11-14 months) produce approximately one communicative act per minute, whereas children at the one-word level (15-19 months) use approximately two acts per minute and children at the multi-word level (22-27 months) produce five acts per minute, in both structured and unstructured contexts (Wetherby et al., 1988).

Not only are there differences in communicative rate, there are also variations in the methods that children use for communication. For example, prelinguistic children are more likely to use gestures alone than children who are at the multiword level (Wetherby et al., 1988). On the other hand, both children who are prelinguistic and those who are at the one-word level predominately use a combination of gestures and vocalizations in their communicative acts (Carpenter et al., 1983; Wetherby et al., 1988). By the multi-word stage, however, children are more frequently using verbalizations alone or a combination of verbalizations with gestures (Wetherby et al., 1988). These findings suggest that gesture use may represent the earliest expression of communicative intent, with some early forms emerging around 6-8 months, and others developing later, around 8-15 months (Bates et al., 1975; Carpenter et al., 1983; Carpenter et al., 1998; Crais, Douglas, & Campbell, 2004).

In summary, children begin participating in communication routines from birth. They begin using sounds, then combine syllables, and eventually produce words. Children also develop communicative intent in the first year of life. During this period they primarily use gestures and vocalizations/verbalizations to express a variety of communicative functions. In their second year of life, children may continue to use these forms with an expanded repertoire of communicative functions, but they also demonstrate growth in the use of words

and word combinations. In addition, during the early portion of their first year, children have a less active role in communication, however, by their second year, they are actively communicating with others. Investigating children from the first to the second year of life offers the opportunity to observe children at very different phases in their communicative and language development. Within the context of caregiver-child interactions, infants' vocalizations in their first year may not be as influential on their caregivers' language use, but by their second year, caregivers' language use may be more likely to be related to children's verbal communication. For these reasons, the current study observes maternal language use with their infants at two distinct points, when the children are approximately 6 and 15 months of age, and documents the children's communication abilities when they are approximately 15 months old.

Theories of Development: Framework for Communication Development

When examining caregiver and child communication, it is necessary to consider a number of factors that may affect one or both of the communication partners. Various theories of development have identified and attempted to explain how these factors influence children's development. The current study is situated in a theoretical framework that draws upon several recent theories of child development recognizing influences in the immediate environment and the larger socio-cultural arena.

First, a transactional perspective of children's development is essential when analyzing the influences from the various systems of children's environments (Bronfenbrenner & Morris, 1998; Rogoff, 1990; Sameroff & MacKenzie, 2003; Vygotsky, 1978). Transactional relationships are those that mutually influence each other (Sameroff & MacKenzie, 2003). Extending the concept of transactional influences to broader

environments, Bronfenbrenner and Morris (1998) provide a bioecological model to describe children's development. According to the bioecological model, children's development is influenced by proximal or immediate contexts that are embedded within distal or environmental contexts. Particular distal environmental contexts that may influence the interactions between caregivers and children are the families' economic resources, place of residence, and education level. Within the proximal or immediate context, proximal processes are specific interactions between the child and other people, objects, or symbols that occur regularly over extended periods of time and with increasing complexity. For example, a proximal process may be a regular book sharing interaction or a social game played between a caregiver and child. These proximal processes are important mechanisms in development and are also influenced by the characteristics of the individual child, distal environmental contexts, and time (Bronfenbrenner & Morris, 1998; Sameroff & MacKenzie, 2003). Thus, caregiver and child communication may be affected by both distal and proximal contexts and each must be considered in the current investigation.

Transactional and bioecological theories also recognize that the influences from distal and proximal contexts on child communication development are not unidirectional. Rather, children influence their environment and the environment continuously influences children (Bronfenbrenner & Morris, 1998; Sameroff & MacKenzie, 2003). Similarly, within the proximal context, caregivers affect their children, while children simultaneously affect their caregivers.

A second theoretical viewpoint focuses on the socio-cultural aspects of children's development. From a socio-cultural perspective, social interactions are the basis of children's development, suggesting that children acquire new abilities when they are engaged

within their "zone of proximal development" during interactions with more capable others (Vygotsky, 1978). The zone of proximal development is the distance between what the child can accomplish independently and what the child is able to achieve with the assistance of more knowledgeable others (Vygotsky, 1978). The guidance provided during these interactions within the zone of proximal development is a form of "scaffolding" and allows children to move from interpersonal processes to intrapersonal processes, subsequently internalizing higher level abilities (Bruner, 1974/1975; Rogoff, 1990; Vygotsky, 1978). Thus, in communication development, the caregiver serves to provide scaffolding or support during social interactions by modifying their language use to assist the child in the understanding and use of communication.

The bioecological framework and socio-cultural theory of development are both particularly relevant to child communication development, since communication is a process of interaction with others, influenced by various contexts (Bronfenbrenner & Morris, 1998; Bruner, 1981; Rogoff, 1990; Sameroff & MacKenzie, 2003; Vygotsky, 1978). As caregivers and children engage in regular social routines and proximal processes, both individuals learn to interpret each other's communicative intentions (Bruner, 1981), and children are supported in their zone of proximal development (Bronfenbrenner & Morris, 1998; Bruner, 1981; Vygotsky, 1978). In this way, caregivers' use of language is an important component of children's proximal contexts and can play a significant role in the child's development and use of language. Therefore, understanding the contributions of caregivers' language use to children's development and the transactional influence of children on caregivers requires longitudinal examination of caregivers' language use with their children, beginning in infancy.

Integrating several viewpoints specific to language development, an interactionist perspective suggests that children's communication abilities develop from a combination of internal abilities and external language input and influences (Chapman, 2000). An interactionist perspective also takes into account abilities from multiple developmental domains and recognizes these influences on communication. As such, communication development is not viewed as occurring in isolation or independent of these other developmental processes; rather, these processes are integrated within the child (Chapman, 2000). The interactionist view, therefore, complements the transactional, bioecological and socio-cultural theories, as they all recognize the importance of social interaction and the relevance of contextual factors on communication development (Bronfenbrenner & Morris, 1998; Bruner, 1981; Chapman, 2000; Rogoff, 1990; Sameroff & MacKenzie, 2003; Vygotsky, 1978). Consequently, this study is situated in a theoretical framework that incorporates aspects of the transactional, bioecological, socio-cultural, and interactionist perspectives.

The longitudinal design and the inclusion of factors representing distal and proximal contexts in the current study allow the examination of maternal and child communication from these combined theoretical perspectives. In particular, distal environmental influences such as family income and education are accounted for by sampling methodology and statistical analyses. In terms of proximal contexts, the current study employs a commonly experienced proximal process, book sharing, as the context of the interaction between children and their mothers. Book sharing interactions provide a context in which parents are observed to create a social routine, use a greater number of words, and produce more complex language than in other interactions (Crain-Thoreson, Dahlin, & Powell, 2001; Hoff-

Ginsberg, 1991; Ninio & Bruner, 1978). For these reasons, the proximal context of book sharing is the context in which the communication interactions between mothers and children are investigated in the current study. Prior to considering the specific distal and proximal influences on caregivers' language use and children's communication development, it is helpful to review the general characteristics of caregivers' language use and the ways in which these characteristics have been measured. In this way, the discussion of distal and proximal factors can be applied to the characteristics of particular interest in the current study.

The Language of Caregivers

The language that caregivers use with their children can be described in terms of its structure and content. The structure of caregivers' language is often documented by identifying several elements such as the total amount of talk, the vocabulary, or the length of utterance. The content of caregivers' language can be described by the type of utterance produced (e.g., question or statement) and the purpose or intention of the utterance (e.g., informative, directive).

Analyzing the Structure of Caregivers' Language

Caregivers' language structure has been represented in several ways in the literature. Typically, the elements of caregivers' language structure that are analyzed include: (a) amount of talk, (b) vocabulary, and (c) length of utterance. Each of these elements will be discussed in the following sections.

Amount of caregiver talk. The total amount of talk is an element of caregivers' language structure that is often defined as the total number of words used by caregivers during caregiver-child interactions. It is related to the duration of interactions and describes

the language exposure that the child receives. Variability is evident in children's exposure to the amount of talk used by their caregivers (Hart & Risley, 1995; Weizman & Snow, 2001). Greater amounts of talk may be useful for children's language learning since it incorporates multiple opportunities to hear the same words, and may also include a variety of sentence contexts in which the words are used (Huttenlocher et al., 1991; Hoff & Naigles, 2002). Furthermore, the number of total words is an important element since it is positively related to caregivers' use of rare words (Weizman & Snow, 2001). Weizman and Snow (2001) indicate that parents who produce a greater amount of talk typically have more rare words in their input to their children. The cumulative effects of different amounts of exposure to parents' talk may help explain the variability in children's communication abilities (Hart & Risley, 1995; Huttenlocher et al., 1991).

Amount of caregiver talk and children's communication abilities. Caregivers' amount of talk has been examined in research due to its potential relationships with children's communication development (Barnes et al., 1983; Hart & Risley, 1995; Huttenlocher et al., 1991). Specific evidence of this relationship was described in a longitudinal study by Barnes et al. (1983). Barnes and colleagues recorded parents' speech to their young children in several naturally occurring conversations with the use a microphone (worn by the child) that was set by a timer to switch on and off periodically throughout the day. The results identified a significant correlation between the amount of speech that parents produced when the children were approximately 2 years of age, and the children's utterance length and semantic complexity measured 9 months later. Similarly, Huttenlocher et al. (1991) conducted another longitudinal study that examined mothers' and children's verbal communications with each other during their typical daily activities. The children

were between the ages of 14 and 16 months at the initial time point, younger than the children in the Barnes et al. (1983) study. The children's vocabulary was measured several times until age 26 months. In this study children's productive vocabulary size was documented during typical daily interactions with their mother. The amount of exposure to mothers' speech at the earliest time point was substantially related to the rate of the children's vocabulary growth over time. In addition, greater frequency of exposure was related to the order of acquisition of these words in the children's vocabularies. Extending these findings by measuring a variety of types of parental input and the children's outcomes at later ages, Hart & Risley (1995) provided comparable results from their longitudinal investigation. That is, they reported that parents' amount of speech per hour was related to the children's rate of vocabulary growth, vocabulary use, and IQ at age 3 years.

Based on the studies reviewed, it is evident that children benefit from greater exposure to caregivers' talk. Caregivers' amount of talk on its own, however, is only one way to look at the structure of caregivers' language input to their children. Analysis of the diversity of caregivers' vocabulary use provides a means to examine the complexity of caregivers' language structure.

Caregiver vocabulary use. Another element of the structure of caregivers' talk is the diversity of the vocabulary they use. Vocabulary diversity can be documented by calculating the number of *different* words that caregivers use with their children during an interaction. Different words are defined as the unique word roots used within a sample of caregiver speech. For example, the words "run" and "running" would only count as a single word root. Research indicates that there is variability in the exposure to diverse vocabulary even within families of similar income levels (Weizman & Snow, 2001).

In addition to the number of different words, some research examines caregivers' use of rare words. Rare words are identified from caregivers' total words by screening out common words based on existing word lists (e.g. Dale-Chall word list; Chall & Dale, 1995) and expansions of the list (e.g. Weizman & Snow, 2001). Additional words are removed if the words are commonly used within the family or culture. This process identifies a list of rare or sophisticated words that are used in the sample. Although most of the vocabulary input that caregivers provide comes from very common words, it appears that the use of rare words may also relate to children's communication outcomes (Weizman & Snow, 2001).

Caregiver vocabulary use and children's communication abilities. In examining both the diversity of caregivers' vocabulary and their use of rare words, researchers have attempted to relate these aspects of caregivers' talk to their children's communication abilities. For example, Hart and Risley (1995) reported that parents who used a greater variety of words had children who displayed better vocabulary growth and vocabulary use at age 3 years. The number of different words produced within a sample was also utilized in a construct of maternal language presented by Bornstein et al. (1998). In their study of concurrent relationships, the diversity of mothers' vocabulary in conversation during a free-play session was positively related to children's verbal comprehension abilities and children's reported expressive vocabulary (Bornstein et al., 1998).

Likewise, Hoff and Naigles (2002) indicated that the lexical diversity of mothers' speech predicted children's expressive vocabulary. Pan et al. (2005) provided further evidence of this relationship in a complex, longitudinal study of families from rural and low income backgrounds, examining maternal language input to children between the ages of 14 to 36 months. Pan and colleagues' analyses suggested that the diversity of maternal

vocabulary was a significant predictor of children's growth in expressive vocabulary, especially when children were around the age of 2 years. In fact, mothers' vocabulary diversity was a stronger predictor of children's vocabulary growth than amount of maternal talk.

Analyses involving parents' use of rare words have indicated that children who hear a greater proportion of rare words from their parents demonstrate better receptive vocabulary skills in kindergarten and second grade (Tabors, Beals, & Weizman, 2001; Weizman & Snow, 2001). Both the density of rare words and the density of instructive interactions related to these words were significant predictors of vocabulary scores in kindergarten and second grade (Tabors, Beals, et al., 2001; Weizman & Snow, 2001).

Clearly there are significant relationships between caregivers' vocabulary use and children's vocabulary outcomes. The studies reviewed here, however, have been narrowly focused on components of caregivers' vocabulary and have not examined the other aspects of caregivers' language use that support children's language learning. Thus, analysis of the structure of caregivers' talk should also include documentation of caregivers' syntax.

Length of caregiver utterances. Length of utterance is another element of caregivers' language structure and is commonly used as an index of syntactic complexity. It is typically based on the average length of an utterance, reported as a mean length of utterance (MLU), measured in units of words or morphemes. Caregivers use varying MLU when speaking to children of different ages (Snow, 1972). There is a trend for caregivers to use simpler syntax and lower MLU with younger children in comparison to their speech to older children (Snow, 1972). There is other research in addition, that argues that caregivers' use of longer utterances may be of greater benefit to children as it offers additional vocabulary and cues to

support comprehension of unknown words (Hoff & Naigles, 2002). Additionally, within a shorter age span (for example, between ages 9 and 15 months), parents' MLU does not appear to change significantly in their interactions with their young infants (Kavanaugh & Jirkovsky, 1982). Most research agrees that it is important to offer input of varying complexity, with longer and shorter MLU as appropriate to the specific conversational context and children's abilities (Barnes et al., 1983; Kavanaugh & Jirkovsky, 1982; Hoff & Naigles, 2002; Snow, 1972).

Length of caregiver utterances and children's communication abilities. Relationships between caregivers' MLU and children's communication outcomes have been identified. For example, maternal MLU predicted children's vocabulary diversity and explained more of the variance in children's outcomes than maternal lexical diversity (Hoff & Naigles, 2002). More specifically, maternal MLU has been proposed as a mediator of the relationship between socioeconomic status and children's vocabulary (Hoff, 2003). Additionally, as part of a construct of maternal language, maternal MLU was related to children's verbal comprehension and maternal reports of children's communication abilities (Bornstein et al., 1998).

Despite the differences between these elements of caregivers' talk, it has been noted that there is a high level of correlation between the amount of talk and the number of different words; that is to say that caregivers who use a high number of total words also produce a greater variety of words (Hart & Risley, 1995; Hoff, 2003; Weizman & Snow, 2001). This relationship was not consistent across studies, however, and each component has been found to be a unique element of caregivers' talk (e.g. Huttenlocher et al., 1991; Pan et al., 2005). Correlations also have been observed between the number of different words and

MLU (Bornstein et al., 1998; Hoff & Naigles, 2002). However, Hoff and Naigles (2002) reported that the variance in maternal MLU made a greater contribution to explaining children's language outcomes than the variance in the number of different words.

Measurements of language structure are useful in determining some of the elements of caregivers' speech that are most relevant in children's language learning; however, structural descriptions alone do not account for all of the features that may impact children's language learning. Consequently, it is necessary to examine additional characteristics that focus on the purposes of caregivers' talk by analyzing the content of their utterances.

Analyzing the Content of Caregivers' Language

The content of caregivers' talk during interactions with their children can be characterized in several ways. Caregivers' talk may be described in terms of the type of utterance produced (e.g. statements, questions, imperatives) and in terms of the purpose or intention of the utterance (e.g. labeling, expanding, directive, imitation). These descriptions are based on analysis of caregivers' language beyond the level of the individual word and are influenced by the context of interaction.

Caregivers' language content often supports children in their participation within an activity (Bruner, 1981; Mannle, Barton, & Tomasello, 1991; Martin & Reutzel, 1999). For example, in order to encourage participation, caregivers use language to engage their children in joint activity and initiate conversational turns (DeLoache & DeMendoza, 1987; Mannle et al., 1991). To examine the nature of their support, caregivers' language content can be classified according to several overall practices. In particular, caregivers appear to: (a) use specific techniques to model language and participation, (b) demonstrate styles of interaction

and responsivity, and (c) use language strategies for particular purposes with varying levels of communicative input.

Specific caregiver techniques to model language/participation. There are several specific techniques that caregivers use to model language and participation. Specifically, caregivers have been observed to imitate children's vocalizations or verbalizations (Hardy-Brown & Plomin, 1985; van Kleeck, Alexander, Vigil, & Templeton, 1996). Additionally, caregivers offer repetitions of their own speech in interactions with young children (Kavanaugh & Jirkovsky, 1982; Snow, 1972; van Kleeck et al., 1996). Another method caregivers use to model language is the use of linguistic mapping (Yoder et al., 1994). Linguistic mapping is the term used to describe a specific form of linguistic responsivity in which caregivers use words to convey their interpretation of a child's nonverbal communicative intention (Yoder et al., 1994). An example of the use of linguistic mapping would be a caregiver producing the statement "You want the ball" in response to a child's act of reaching for a ball.

Specific caregiver techniques to model language/participation and children's communication abilities. Caregivers' use of specific techniques to model language is directly related to children's language development. One such technique, imitation of child vocalizations, has been suggested as a method to facilitate language development (Hardy-Brown & Plomin, 1985; Snow, 1972). In particular, maternal imitation of infant vocalizations during play, feeding, and teaching situations when infants were 12 months of age positively correlated with concurrent indicators of infant communicative competence (Hardy-Brown & Plomin, 1985). Further, there has been evidence that mothers' use of linguistic mapping with their children (developmental age of 15 months) was related to

children's expressive vocabulary measured 12 months later (Yoder et al., 2001). Additionally, parents' use of questions or self-repetitions may be related to children's syntactic development (Barnes et al., 1983; Hoff-Ginsberg, 1986).

Although it is useful to identify the specific techniques that are used by caregivers to support children's language learning, most caregivers use a combination of these techniques in their interactions. Therefore, it may be more helpful to consider the contribution of multiple techniques to children's language acquisition.

Style of caregiver interaction/ responsivity. Rather than examine a single technique that caregivers use, an alternative way to look at the content of caregivers' talk is to identify patterns involving several techniques that reflect caregivers' style of interaction and level of responsiveness. One commonly described style is a language facilitative style, characterized by caregivers expanding the child's vocal production, following a child's lead, and producing elaborated discourse (Barnes et al., 1983; Fewell & Deutscher, 2004; Hockenberger et al., 1999; Kloth, Janssen, Kraaimaat, & Brutten, 1998; Ninio, 1980; Whitehurst et al., 1988). A language facilitative style can also reflect caregivers' responsiveness to their children. The term "responsivity" or "responsiveness" also conveys the reciprocal nature of language interactions between children and caregivers. Additionally, responsivity can be measured by several dimensions (e.g. warmth of tone, sensitivity to child's abilities and behaviors, use of language facilitation techniques) that reflect the social nature of interactions. Caregivers displaying higher responsiveness modify their language and behaviors in response to their children's communication and behaviors (Baumwell et al., 1997; Rollins, 2003; Tamis-LeMonda et al., 2001).

In contrast, a limiting or directive style describes caregivers who are focused on their own agenda during interactions, who do not vary their language input according to the child's abilities, or who use minimal language with their children (Baumwell et al., 1997; Hart & Risley, 1995). Likewise, caregivers who are less responsive may be depicted as more intrusive, and these caregivers generally prefer to maintain greater control of the interaction (Baumwell et al., 1997; Hart & Risley, 1995). For example, caregivers' talk that is more intrusive and directive in nature would include utterances that interrupt and redirect a child's focus of attention, and that do not encourage a variety of children's verbal output during the interaction (Masur et al., 2005; Tomasello & Farrar, 1986).

Examples of these styles can be seen in the work of Kloth and colleagues (1998) that identified three main styles of mothers' speech with their preschool-age children within a free play context. Two of these styles, the "Non-intervening" and "Explaining" style, can be considered language facilitative, as they represent different forms in which mothers encourage children's participation and learning. The third style, which is less facilitative of language, "Directing", describes mothers who are leading the child's behavior, rather than following the child's lead. Similarly, within a book sharing context, Ninio (1980) indicated that mothers from different socioeconomic levels produced talk that could be represented by three styles. In two styles, mothers encouraged their children to respond to their questions either verbally or by pointing, as a means to promote language development. Whereas the third style described mothers' talk that provided information but did not seek the child's input.

Style of caregiver interaction/responsivity and children's communication abilities. There is evidence suggesting that caregivers' interaction styles and level of responsiveness

relate to their children's communication development. In particular, a facilitative or higher caregiver responsivity style has been related to positive child communication outcomes (Barnes et al., 1983; Baumwell et al., 1997; Fewell & Deutscher, 2004; Hockenberger et al., 1999; Karrass et al., 2002; Peterson, Jesso, & McCabe, 1999; Whitehurst et al., 1988). In this section, research that identifies relationships between caregiver styles of interaction and children's communication abilities will be presented initially, followed by research that specifically examines caregivers' responsivity in relation to children's communication outcomes.

In a study that examined the influence of maternal interaction style on children's development, Fewell and Deutscher (2004) indicated that mothers who were rated as using a highly facilitative style when the children were age 30 months, had children who displayed better cognitive abilities at age 3 years, as well as higher verbal and reading abilities measured at ages 5 and 8 years. In this instance a facilitative style included using extended or elaborate talk to discuss objects or events, but in other studies these characteristics have also been defined as maternal verbal encouragement (Karrass et al., 2002). Indeed, Karrass and colleagues noted that when mothers displayed higher levels of verbal encouragement with their 12 month old children during free play sessions, their children had better concurrent language abilities (Karrass et al., 2002).

In attempting to improve children's communication development, there have been intervention studies that have focused on teaching caregivers more facilitative styles of interaction. The studies that have taught caregivers to use specific communication methods have generally resulted in increases in the children's vocabularies and verbalizations (Hockenberger et al., 1999; Peterson et al., 1999; Whitehurst et al., 1988). For example

when mothers were taught to use open-ended and wh-context questions during narrative conversations, their children demonstrated gains in vocabulary and later narrative skill (Peterson et al., 1999). In relation to book sharing contexts, parents who were taught interactive methods of communication (e.g. asking questions and expanding children's utterances), had children who demonstrated gains in expressive vocabulary and increases in their MLU in comparison to children whose parents who did not receive this form of intervention (Whitehurst et al., 1988; Whitehurst et al., 1994). Additionally, when parental comments related to a child's experiences were introduced during book reading, preschool-age children were observed to use greater amounts of verbalization and this process appeared to facilitate interaction during book reading (Hockenberger et al., 1999).

These research studies provide evidence that caregivers' interactive style influences children's communication, with positive relationships observed between a facilitative style and children's vocabulary, syntax, narrative skill, and participation. However, solely documenting caregivers' style of talk does not always take into account whether or not caregivers are specifically responding to their child's behavioral or verbal cues. Therefore, it is also useful to examine the relationships between the responsive quality of caregivers' talk and children's communication abilities.

There is an extensive body of literature documenting the relationships between caregivers' responsivity and children's communication. For example, Rollins (2003) indicated that a greater amount of maternal contingent comments at 9 months predicted higher vocabulary comprehension abilities for infants at both 12 and 18 months. There was also evidence of relationships between maternal contingent comments at 9 months and children's language production at 30 months (Rollins, 2003). By comparison, a less

responsive approach, in which parents attempted to redirect a child's focus of attention or restrict children's behavior, may have had negative implications for vocabulary learning (Baumwell et al., 1997; Hart & Risley, 1995; Tomasello & Farrar, 1986).

In a series of studies measuring different forms of responsiveness, Tamis-LeMonda and colleagues (Baumwell et al., 1997; Bornstein et al., 1999; Tamis-LeMonda et al., 2001) have provided substantial evidence linking maternal responsiveness to children's communication development. Baumwell et al. (1997) suggested that maternal verbal sensitivity at 9 months predicted children's language comprehension at 13 months. In contrast, verbal intrusiveness, which consisted of prohibiting or restricting child behaviors or attention, did not predict children's language comprehension. Extending their work to the examination of maternal verbal responsiveness and its relationship with children's expressive vocabulary, Bornstein et al. (1999) noted that maternal verbal responsiveness at 13 months predicted children's productive vocabulary at 20 months, whereas the number of different words produced by mothers at 13 months did not predict children's vocabulary. When considering how the child influenced the mother, the change in the children's vocabulary between the two ages (13 months and 20 months) predicted maternal verbal responsiveness, but not maternal vocabulary (Bornstein et al., 1999). Additional research reported that maternal responsiveness contributed in specific ways to the timing of children's language milestones (Tamis-LeMonda et al., 2001). These results suggested that maternal responsiveness at 9 months predicted the timing of earlier expressive language achievements in children (e.g. imitations and first words), whereas maternal responsiveness at 13 months was more predictive of later expressive language milestones (e.g. production of 50 words, combining words, and talking about the past). The reciprocal nature of these results provides

at least partial support for a transactional perspective (Sameroff & Mackenzie, 2003). That is, mothers' and children's communication are influencing each other at least with respect to maternal responsiveness and child vocabulary development.

Recent findings from Masur and others (2005) reinforce the notion that particular dimensions of maternal responsiveness are important to children's communication at different points in development. Specifically, a behavioral dimension of responsiveness (including behavior ratings and action imitation) at 10 months predicted children's vocabulary at 13 months, but a verbal form of responsiveness (verbal imitation) at 13 months predicted their vocabulary outcomes at 17 months. Both dimensions of responsiveness predicted children's vocabulary at 21 months. Interestingly, these researchers also examined different forms of directiveness and indicated that forms of supportive directiveness (as opposed to intrusive directiveness) also contributed to children's vocabulary development. Intrusive directiveness, however, had a negative association with child vocabulary outcomes.

These studies reflect the relevance of caregiver responsiveness to children's development and indicate that the timing of responsiveness influences different components of children's communication abilities. The research described, however, does not consistently analyze the purpose or level of abstractness in caregivers' talk. Thus, examining caregivers' use of language strategies offers information regarding these aspects of the content of caregivers' talk

Caregiver language strategies. Another way to describe the content of caregivers' language is to consider their use of language strategies. Language strategies can be defined at the level of an individual utterance and generally involve creating a system to code the purpose of each utterance in caregivers' talk. In book sharing research, the focus of analysis

is on caregivers' utterances that go beyond the printed text, and have been referred to in the literature as extratextual utterances. Evidence suggests that caregivers use extratextual utterances for various reasons including: (a) to gain the child's attention or maintain the interaction, (b) to label or describe, (c) to interpret the child's actions, (d) to encourage participation, (e) to offer language models, (f) to explain information from the book, (g) to provide feedback, and (h) to teach book/print conventions (DeLoache & DeMendoza, 1987; Ninio & Bruner, 1978; Roberts et al., 2005; van Kleeck et al., 1996; van Kleeck et al., 1997).

Extratextual utterances also can be categorized based on the level of abstractness or level of communicative demand placed on the child by the caregivers' language (DeTemple, 2001; Pellegrini, Brody, & Sigel, 1985; Pellegrini et al., 1990; van Kleeck et al., 1997). For example, a lower level language strategy would include caregiver utterances that reflect more concrete content and thus place less demands on the child, whereas a higher level language strategy conveys more abstract information and has higher demands. Caregiver utterances may fall along a continuum of concrete to abstract content or low to high communicative demand. Although level of abstractness and level of communicative demand are different concepts, there are similarities between them, such that concrete utterances are typically of lower communicative demand, and abstract utterances are of higher communicative demand. For this reason, the discussion of language strategies will be described based on the level of abstractness in caregivers' language. Concrete language during book sharing is characterized by content that refers to items present in the environment and focuses on topics closely related to the book (DeTemple, 2001; Pellegrini et al., 1985; van Kleeck et al., 1997). Some examples of concrete forms of language during book sharing include labeling pictures and asking questions requiring the child to locate or notice an item in the book or immediately

visible to the child and caregiver. Abstract language during book sharing is characterized by content that may require understanding of items not in the immediate environment (DeTemple, 2001; Pellegrini et al., 1985; van Kleeck et al., 1997). Examples of abstract forms of language include making predictions and asking questions that require interpretations (Pellegrini et al., 1985; van Kleeck et al., 1997).

The documentation of language strategies in the context of book reading has been illustrated by the work of DeTemple (2001) who described parents' talk with preschool age children as consisting of two categories of language strategies: (a) immediate talk, and (b) non-immediate talk. Immediate talk represents more concrete levels of language, including comments and questions that are focused on the present. The topics of these utterances are closely related to the pictures or words in the book. Examples from this study included utterances that drew children's attention to specific pictures, or utterances requesting children's participation in a fill-in-the-blank routine. Non-immediate talk consists of utterances that have some relation to the items in the book but extend the ideas beyond the immediate context and represent more abstract language content. Some examples included utterances that connected ideas to children's general knowledge, made predictions, or provided explanations. Most of the parents' extratextual utterances in the DeTemple study appeared to be within the category of immediate talk, although the proportion of immediate talk decreased when children were older and there was an increase in the proportion of non-immediate talk when children were older.

Caregiver language strategies and children's communication abilities. Research has examined caregivers' language strategies within book sharing interactions for relationships with children's communication abilities. During book sharing with young children,

caregivers' use of language strategies was positively related to the children's receptive vocabulary (DeTemple, 2001; Roberts et al., 2005). In a prospective, longitudinal study examining home literacy practices of African-American families with lower incomes, Roberts and colleagues (2005) provide evidence for this relationship. In their investigation of maternal book reading strategies, Roberts et al. (2005) analyzed maternal and child language use when children were age 2, 3, and 4 years old. Mothers who used a greater number of strategies (averaged across years), had children with higher receptive vocabulary scores at age 3 years and at kindergarten entry.

In addition to the total number of language strategies used, different types of language strategies may have specific relationships with later child outcomes. For example, in DeTemple's (2001) study looking at immediate and non-immediate talk, mothers' use of more non-immediate talk when their children were age 3 years was related to the children's receptive vocabulary outcomes at age 5 years. In contrast, there were no specific relationships identified between the use of immediate talk and child language outcomes. Different types of language strategies that incorporate the use of several levels of abstraction may promote children's learning of more abstract forms of language. During book sharing interactions, parents' input at different levels of abstraction was positively correlated with children's ability to deal with the most abstract level of language one year later (van Kleeck et al., 1997). Providing different levels of abstraction supports children's language development since it offers children opportunities for both success in understanding input at lower levels and for learning through exposure to higher levels of abstract language (van Kleeck et al., 1997).

The demand level of language strategy used by caregivers may also relate to children's participation, particularly in situations of varying familiarity with the text. One way to document children's participation is through their initiations during book sharing. Research has indicated that initiations are increased by the use of differential caregiver strategies dependent on the familiarity of the text (Pellegrini et al., 1990). For example, in the work of Pellegrini and colleagues, greater child initiations were related to mothers' use of lower demand strategies (e.g. labeling, describing) in unfamiliar text formats, and to mothers' use of higher demand strategies (e.g. making inferences, evaluating events) in familiar formats.

In summary, by examining caregivers' use of language strategies, several aspects of the content of their language can be considered. Specifically, the use of language strategies reflects caregivers' techniques to model language, their interaction style, and their responsiveness. Additionally, language strategies also can be categorized based on the level of abstractness present in caregivers' language. Furthermore, from a socio-cultural and transactional perspective of development (Sameroff & MacKenzie, 2003; Vygotsky, 1978), caregivers' use of language strategies demonstrates their use of scaffolding, while also conveying the reciprocal influences of child and parent on the nature of the interaction. The current investigation examines the content of maternal talk by identifying and analyzing the language strategies utilized by mothers during a book sharing interaction with their young children.

Factors Influencing Development

Any detailed examination of the structure and content of caregivers' talk to their children must also include consideration of factors that may influence caregivers' language

use and children's communication. As discussed earlier, children's communication development is influenced by both distal and proximal environmental factors. Specifically, the current study considers the distal influences of family income and place of residence as well as maternal education level on maternal language use and children's communication. In addition, the proximal factors of interest include the child's age or communication ability, and the particular social context of the interaction.

Distal Influences on Development: Low Income and Rural Environments

Common distal environmental contexts that play a significant role in shaping children's development are family income and place of residence (Bronfenbrenner & Morris, 1998; Sameroff & MacKenzie, 2003). Due to the potentially disruptive impact of these distal factors on proximal processes, children in families of lower income and who live in rural areas are at increased risk for delays in their development (Duncan, Brooks-Gunn, & Klebanov, 1994; Evans, 2004; Lee & Burkam, 2002; McLoyd, 1998). As described earlier, proximal processes are the interactions that occur between the child and other people, objects, or symbols in the child's environments. Proximal processes are also defined by their consistent occurrence over an extended period of time and are viewed as important mechanisms of development (Bronfenbrenner & Morris, 1998).

In the United States, there are 12.8 million children, representing about 18% of all children, living at or below the poverty threshold (National Center for Children in Poverty [NCCP], 2006). The federal poverty level is defined annually, and in 2005 it was listed as $19,350 for a family of four with two children (NCCP, 2006). Since there is evidence that families need more than two times the income above the poverty level to meet their basic needs, many researchers consider children within families who are below 200% of the federal

poverty level to also be at risk (NICHD Early Child Care Research Network, 2005b). Using this criterion, there are approximately 28.4 million children (representing 39% of all children in the U.S.) who live below the 200 percent poverty level (NCCP, 2006). In this manuscript, families with incomes that are below the 200% poverty level will be described as families with low incomes. Income is usually one of the major components of socio-economic status (SES), and in most research studies those families with low incomes are typically within lower SES groups, and families with higher incomes are usually within higher SES groups.

In addition to family income, a family's residential location may be another distal influence on the proximal processes guiding the child's development. Families' residential locations are often classified based on the relative population size. Rural locations include small cities and open countryside, whereas urban areas consist of large cities and their suburbs (O'Hare & Johnson, 2004). It is estimated that of the approximately 14 million children living in rural areas of the United States, 2.6 million children live in families with incomes below the official poverty level (O'Hare & Johnson, 2004). These figures indicate that approximately 20% of the children from rural areas live in poverty, a higher rate than observed in urban areas (approximately 16%). Moreover, when families who have incomes below 200% of the poverty level are included in the analyses, 47% of the children in rural areas are from families with low incomes. Nationally, this corresponds to approximately 5.1 million children who live with families whose income is low and who also live in rural areas (NCCP, 2006). Supporting these data, Lee & Burkam (2002) indicate that there is a greater proportion of children from lower SES groups living in rural areas, in comparison to children from the highest SES group (Lee & Burkam, 2002). In contrast, children from higher SES

groups are more likely to live in suburban areas than children from lower SES groups (Lee & Burkam, 2002).

Children who live in rural areas may face different challenges than children in metropolitan or suburban areas. Those living in rural areas may experience more disadvantages because of the greater distances to workplaces, healthcare, social services, and childcare (O'Hare & Johnson, 2004). Therefore these distal factors may influence children's proximal contexts and processes, in terms of time spent with parents or the quality of the healthcare or childcare they receive. Children who attend schools in rural areas have fewer problems in the neighborhood surrounding the school than children in large cities (Lee & Burkam, 2002). Although there may be fewer differences between children in rural and urban schools in terms of within school problems, the children attending school in rural areas are more likely to experience within school problems than children in suburban schools (Lee & Burkam, 2002). Additionally, children in rural areas typically attend public schools of lower quality, whereas children from suburban areas have access to the highest quality schools (Lee & Burkam, 2002). These school characteristics may also contribute to observed differences in achievement scores, where children in rural areas demonstrate lower math and reading achievement at kindergarten entry than children who live in suburban areas (Lee & Burkam, 2002).

Relationships of income level with caregivers' language use. One way in which family income may influence children is through its influence on caregivers' language use. Families with low incomes often experience a greater amount of negative, stressful events, may have greater health problems, and have fewer resources available to them (Evans, 2004; McLoyd, 1990). Subsequently, parents with low incomes may use harsher parenting

behaviors and may provide less complex language stimulation (Hart & Risley, 1995; McLoyd, 1998; NICHD Early Child Care Research Network, 2005b). Given the importance of parents' language to children's language, children from low income environments are more likely to experience academic and language difficulties (Duncan et al., 1994; NICHD Early Child Care Research Network, 2005b; McLoyd, 1998). Parents' language use may be one mediating factor between income and children's language abilities (Hart & Risley, 1995; Hoff, 2003). Further, parents' language and interaction styles may be influenced by the duration of poverty (Evans, 2004). Often these parental influences are stable over time, and result in increasing impact on children's language outcomes (Fish & Pinkerton, 2003; Hart & Risley, 1995).

There is evidence that caregivers at various income levels use language differently during interactions with their children (Hart & Risley, 1995; Heath, 1982; Hoff, 2003; Ninio, 1980). For example, based on findings from their longitudinal research, Hart and Risley (1995) indicated that parents from different SES groups (classified according to several components, including income) produced varying amounts of talk, with parents from the lowest SES group using approximately 3 to 4 times fewer words per hour in comparison to the highest SES group. Similarly, in her research, Ninio (1980) noted that mothers from lower SES levels produced less talk to their children than mothers from higher SES levels.

Not only are there differences in caregivers' amount of talk across income levels, differences are also evident in the types of words used by caregivers. For example, there are variations in the number of different words produced among levels of income/SES, with more diverse vocabulary evident in mothers within higher income/SES groups (Bornstein et al., 1998; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Ninio, 1980). Moreover, mothers with

mid-level incomes supported their children and modeled language during book sharing by providing labels for a variety of pictures, using comments relating the pictures in a book to the child's experience, asking and answering their own questions, and indirectly using more positive methods to correct their child (DeLoache & DeMendoza, 1987; Ninio, 1980; van Kleeck et al., 1996). In contrast, children from families of lower income/SES levels heard fewer encouragements from their parents during book sharing (Hart & Risley, 1995). Furthermore, there appeared to be a greater relative amount of prohibitions or behavior directives in the talk of parents from the lowest income/SES level when compared with parents at higher levels (Hart & Risley, 1995; Hoff-Ginsberg, 1991; McLoyd, 1998).

Likewise, income level also appears to influence the length of utterances produced by caregivers, with mothers from lower SES groups using shorter utterances than mothers from higher SES groups (Hoff, 2003). Hoff (2003) suggested that mothers' utterance length mediated the relationship between family SES and children's expressive vocabulary. This implies that the influence of income/SES on children's vocabulary can be explained in part by mothers' length of utterance. Thus, the evidence presented suggests that family income level influences different aspects of caregivers' language use, such as their amount of talk, the diversity of their vocabulary, and the length of their utterances. These caregiver language components may in turn affect children's language development.

Relationships of income level with children's outcomes. Along with influences on caregivers' language use, low income environments are linked to lower overall developmental outcomes in children. Of specific concern is that children in low income settings are more likely to display lower overall cognitive abilities (Duncan et al., 1994; McLoyd, 1998). In order to identify relationships between income and children's

development, researchers have examined the characteristics of low income settings. Children living in low income settings often experience numerous risks, such as decreased social support, authoritarian parenting, and greater family disruptions (Evans, 2004; McLoyd, 1998). They also may have less predictability, consistency, and structure in their daily routines (Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005; McLoyd, 1998). The disorganized nature of their daily activities may interfere with development since it can interrupt or interfere with proximal processes such as social games or book sharing opportunities (Bronfenbrenner & Morris, 1998; Evans et al., 2005). Additionally, children who live in poverty may experience higher rates of prenatal risk (e.g. exposure to illegal or legal drugs) and diminished physical health status at birth (e.g. low birth weights) (McLoyd, 1998). Since children living in low income settings may not have access to the variety of resources needed to balance the potentially negative effects of these conditions, they may subsequently display delays in cognitive development (McLoyd, 1998). The cumulative effect of these risks, along with the duration or persistence of poverty may be key elements in influencing children's later development (Duncan et al., 1994; Evans, 2004; McLoyd, 1998; NICHD Early Child Care Research Network, 2005b).

Furthermore, income is a significant predictor of achievement scores for many children (Lee & Burkam, 2002; McLoyd, 1998). Poorer performance in academic achievement is likely seen in children who experience persistent poverty (Evans et al., 2005; McLoyd, 1998). These types of limitations in academic abilities have been documented as early as kindergarten entry. By entry into kindergarten, many children from lower SES levels demonstrated lower reading and math achievement scores than children from the highest SES levels (Lee & Burkam, 2002).

Children's language skills also appear to be differentiated by family income (Duncan & Brooks-Gunn, 2000; Hart & Risley, 1995; Hoff, 2003). Specifically, Hart and Risley (1995) documented significant influences of SES on children's vocabulary growth, vocabulary use, and IQ at age three years. Extending these findings to broader aspects of language, research has suggested that children who live in poverty demonstrate below average abilities in language development (Fish & Pinkerman, 2003) and children from families who were chronically poor displayed the lowest scores on measures of language and school readiness (NICHD Early Child Care Research Network, 2005b). Fish and Pinkerman (2003) reported that at ages 4 and 5 years, children from rural, low income backgrounds displayed language abilities below the average range on a standardized assessment. Although these authors did not observe significant differences from typical development for the children from rural, low income environments when they were age 15 months, the children with larger productive vocabularies were the ones that were more likely to achieve average scores on language assessment at age 4 and 5 years. These findings indicate that language ability as early as 15 months is related to later language achievement, supporting the results of other researchers (e.g. Bornstein & Haynes, 1998; Fenson et al., 1993).

The relationship between income and children's developmental outcomes may not be linear however. Positive changes in income have a larger influence on children's IQ and vocabulary scores for those children with families whose incomes are below or near the poverty level than for children in families from higher income groups (Dearing, McCartney, & Taylor, 2001; McLoyd, 1998). The influence of income on children's language and achievement may be mediated by the learning environment and stimulation available in the

home, as well as other socio-emotional characteristics of the parents (Duncan & Brooks-Gunn, 2000; Duncan et al., 1994).

Thus, children from families with low incomes are often exposed to fewer words overall, less diverse vocabulary, a greater proportion of prohibitions or behavior directives, and shorter utterances from their caregivers (Bornstein et al., 1998; Hart & Risley, 1995; Hoff-Ginsberg, 1991). The combination of these characteristics of caregivers' language can significantly influence the language learning environment experienced by children living within families with low incomes. Additionally, there is evidence that children from higher income families have parents that teach them how to use language in ways that are typically valued in traditional school environments (Heath, 1982). Subsequently, children living within low income settings are likely to display relatively lower scores on language and school readiness measures, in comparison to children from families with greater economic resources (Lee & Burkam, 2002).

In conclusion, children who live in low income and rural environments are at increased risk for disruptions to their development. Specifically, children from low income and rural environments are more likely to display lower cognitive and overall language ability (Duncan & Brooks-Gunn, 2000; Duncan et al., 1994; Lee & Burkam, 2002; NICHD Early Child Care Research Network, 2005b). Since children's early language abilities influence their later language and school readiness (Bornstein & Haynes, 1998; Fish & Pinkerman, 2003; Hart & Risley, 1995), it is important to promote language learning from infancy. Moreover, there are a limited number of studies that analyze caregivers' language and children's communication development with very young children and their families who are from rural and low income environments. Therefore, the current study provides detailed

examination of maternal language to infants and toddlers in families who live in rural, low income environments, in order to identify potential differences in the features of mothers' language use over time and examine their relationships with children's communication.

Distal Influences on Development: Maternal Education

Maternal education level is another distal environmental factor that can influence children's development. It is a background characteristic of the mother, and it is often included as a component of socio-economic status (SES). The level of formal education is, however, a more stable indicator than other components of SES (such as family income), and it has been utilized frequently as an independent factor in research (Hoff, Laursen, & Tardiff, 2002; McLoyd, 1998). Maternal education is associated with several aspects of parenting such as maternal talk to children, discipline practices, and parenting style (Hoff et al., 2002). Additionally, there are strong relationships between maternal education and children's outcomes (Hart & Risley, 1995; Hoff-Ginsberg, 1991; Ninio, 1980; Rowe et al., 2005). Of particular interest in this study are the potential relationships between maternal education and maternal language use and the influences of maternal education and language use on children's communication.

Relationships of maternal education with caregivers' language use. Mothers' education level has been related to variations in the way mothers use language with their children (Hart & Risley, 1995; Hoff-Ginsberg, 1991). Many studies report relationships between maternal education and maternal language use that are similar to those identified with income level. For example, mothers with lower levels of education produce less talk, offer less diverse vocabulary, and use shorter utterances, whereas those with greater education provide more input, with greater vocabulary diversity, and longer utterances (Hart

& Risley, 1995; Hoff-Ginsberg, 1991; Ninio, 1980; Rowe et al., 2005). Likewise, as with income level, the nature of mothers' talk may be influenced by education level. Specifically, there is evidence indicating that mothers with more education provide a greater amount of conversation-eliciting talk, and fewer directives when interacting with young children than mothers with high-school educations (Hoff-Ginsberg, 1992).

In addition, Ninio (1980; 1983) indicated that mothers with lower education were not necessarily as sensitive to children's growth and change, and did not support more complex language use, whereas mothers with higher levels of education were more attuned to their children's abilities. Although there were three different parental interaction styles in both low and high education/SES groups, Ninio's (1980) study only noted an association between interaction style and aspects of children's vocabulary in the higher education/SES group. She suggested that these relationships reflect adjustments made by parents in the higher SES group to utilize different interaction styles, based on children's abilities, but noted that there was no evidence to support these adjustments within the lower SES group.

Differences across educational levels have also been noted in mothers' contingent communication specifically during book sharing interactions. In Hoff-Ginsberg's (1991) research, maternal contingent communication was defined as the use of topic-continuing utterances that reflect connections between children's utterances and mothers' utterances. Specifically, mothers from a lower education group produced fewer topic-continuing utterances than mothers from a higher education group (Hoff-Ginsberg, 1991). Even within a sample of mothers with low incomes, recent longitudinal research from Rowe et al. (2005) suggested that maternal education predicted the total amount of maternal speech and vocabulary diversity used during interactions with their 14 to 36 month old children.

Relationships of maternal education with children's outcomes. Beyond its influence on maternal language, maternal education is also positively related to children's communication outcomes (Bee et al., 1982; Dollaghan et al., 1999; Hart & Risley, 1995). An investigation of a group of working and middle-class Caucasian families, suggested that maternal education may specifically influence children's later outcomes (Bee et al., 1982). Bee and colleagues (1982) reported that maternal education predicted children's receptive and expressive language scores at 36 months, and children's IQ at 48 months. Dollaghan et al. (1999) also presented data supporting the role of maternal education by demonstrating that several aspects of preschool-aged children's spontaneous speech differed among groups that were classified based on the mother's level of education. Specifically, children whose mothers had less than a college degree used shorter utterances and less diverse vocabulary in spontaneous speech, in comparison to children with mothers who had college degrees. These differences in children's vocabulary were evident both in spontaneous speech and standardized vocabulary test scores (Dollaghan et al., 1999). In addition to influencing children's utterance length and vocabulary skills, mothers' education may also influence children's comprehension of syntax. Children whose mothers did not have college degrees displayed lower comprehension of complex sentences, whereas children with mothers who had college degrees had a greater understanding of the syntax in these sentences (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002).

These identified relationships between maternal education and maternal language use, as well as the relationships between maternal education and children's communication, emphasize the need to account for education level when examining caregivers' language use and children's communication in any context. Consequently in the current study, maternal

education level is included as a factor in the analyses of the relationships between maternal language and children's communication.

Proximal Influences on Development: Child and Social Context Factors

In addition to the distal environmental influences of income and maternal education level, proximal contexts also contribute to both caregivers' language use and children's development. The current investigation considers the proximal factors of the child's age or communication ability, and the particular social context of the interaction.

Child factors influencing caregivers' language use. One proximal influence on caregivers' language use may be the child's age or communication ability. There is evidence that caregivers modify their language based on their child's age and their perception of their child's communication ability (e.g. DeLoache & DeMendoza, 1987; Martin, 1998; Snow, 1972; van Kleeck & Beckley-McCall, 2002). For example, mothers appear to initiate most topics of conversation and take most of the conversational turns with very young infants, whereas with older children, mothers allow children to initiate conversation and take more turns (DeLoache & DeMendoza, 1987). Comparing mothers' use of language with varying ages of children (2 years of age and 10 years of age), Snow (1972) observed differences in sentence complexity and use of repetitions in mothers' language use based on children's ages. Specifically, the mothers used simpler sentences and more repetitions with the 2-year old children in comparison to their talk to 10-year old children. Similarly, supporting the notion that parents modify their speech based on their children's ages, Kavanaugh & Jirkovsky (1982) observed in a longitudinal study of young infants and toddlers, that parents used references to present objects when children were younger and referred more frequently to absent objects as the children increased in age. Parents also used more utterances with

non-specific content (e.g. sound play, imitation of infant sounds) when children were younger (age 9 months) in comparison to when children were older (age 15 months). Although there was no significant variation in parents' MLU with children within this short time span, the amount of exact self-repetitions did decrease over time. Since exact self-repetitions are considered another measure of reduced complexity of parents' speech, the findings provide support for the idea that parents' speech is more complex with older children.

Likewise, in examining mothers' utterances during book sharing, Martin (1998) noted that mothers' talk varied based on the age of their children. For the younger children (ages 6, 12, and 18 months of age), mothers focused on simplifying text concepts and used strategies to engage the child's interest. With the older children (ages 2 and 4 years) mothers were more likely to use questions and explain the text. Similarly, van Kleeck and colleagues reported that there was a greater emphasis on gaining and maintaining attention with younger infants, whereas there was more talk about the specific aspects of the book with preschool age children (van Kleeck et al., 1996; van Kleeck et al., 1997). Moreover, DeLoache and DeMendoza (1987) reported that younger children (ages 12 and 15 months) were more likely to hear simple information (e.g. labels), whereas older children in their study (age 18 months) received more complex input from their mothers. Specifically, the mothers of the older children were more likely to use questions and provide elaborate information in their talk about pictures in the book. Additionally in DeLoache and DeMendoza's (1987) investigation, mothers of the younger children made fewer comments relating the items in the book to the child's previous experiences in comparison to mothers of the older children.

Extending the research to examine variations in the content of mothers' language influenced by children's ages, DeTemple (2001) presented findings of a longitudinal study of book sharing with preschool-age children. DeTemple (2001) reported that with younger children (ages 3 and 4 years) mothers used more extratextual utterances (utterances that go beyond the specific text printed in the book) than simply reading the text. Of these extratextual utterances, a higher proportion of them were classified as immediate talk (utterances that relied on objects or events in the immediate environment), with a lower proportion of utterances within the non-immediate talk category (utterances that add ideas or concepts and represent more abstract language). Although mothers maintained a higher proportion of immediate talk than non-immediate talk when talking with their older children, there were differences evident within each category over time. In particular, the proportion of immediate talk utterances decreased over time and the proportion of non-immediate talk utterances increased over time, partly due to mothers' decrease in overall number of extratextual utterances with the older children and more reading of the actual words in the book.

Another factor influencing mothers' language use is parental perception of their child's communication abilities. Caregivers use language based on their knowledge of the child's ability or their awareness of feedback from the child (Kavanaugh & Jirkovsky, 1982; Snow, 1972; van Kleeck et al., 1997). In book sharing sessions, mothers were more likely to name pictures or provide information about items in the book if the mother believed that their child did not have this knowledge (DeLoache & DeMendoza, 1987). Otherwise, mothers used pictures to support their children's successful participation in book sharing by asking them to produce the names of pictures or demonstrate their knowledge of items that

caregivers believed were already familiar to them (DeLoache & DeMendoza, 1987; Ninio, 1983).

Parents also vary their use of language strategies dependent on their child's language ability or vocabulary levels (Pellegrini et al., 1985; Pellegrini et al., 1990). Parents were more likely to use language strategies that have lower communicative demands (e.g. labeling) with children who had lower language or vocabulary abilities (Pellegrini et al., 1985; Pellegrini et al., 1990). Use of these types of language strategies also has been related to verbal IQ, with the use of lower demand strategies being related to the verbal IQ of children with communication impairment and the use of higher demand strategies (e.g. making inferences) being related to the verbal IQ of children with more advanced language abilities (Pellegrini et al., 1985). Additionally, parents used lower demand strategies when children displayed lower vocabulary scores and provided greater use of metalinguistic verb forms when children displayed higher vocabulary scores (Pellegrini et al., 1990). There was evidence however, that parents used both lower and higher level strategies to support their children's language learning. Van Kleeck et al. (1997) have argued that parents provided input at several levels of abstractness for different purposes. Specifically, the input at lower levels of abstractness (i.e. concrete language), which the child may already have achieved, supports the interaction, whereas parents' use of more abstract language promotes learning. Although van Kleeck et al. (1997) offer an alternative perspective on parents' language use during book sharing; their findings also support the idea that parents use particular language forms and strategies based on their child's language abilities.

The existing research offers evidence that caregivers are responsive to children's developing language by adjusting the content of their speech on the basis of the children's

age and/or ability level (DeLoache & DeMendoza, 1987; Pellegrini et al, 1990; van Kleeck et al., 1997). Caregivers also seem to have the goal of seeking their child's highest level of ability (DeLoache & DeMendoza, 1987) and then scaffolding their child's language learning through the use of various strategies (van Kleeck et al., 1997). From a Vygotskian perspective, it is this process of interaction within a child's zone of proximal development that facilitates the child's language development (Vygotsky, 1978).

To document the potential influence of the proximal factor of children's ages/developmental level on mothers' language use, the current investigation analyzes mothers' language use at both 6 and 15 month time points. By including children at these young ages, this study extends the literature that describes characteristics of mothers' talk during book sharing. Additionally, due to the longitudinal design, the current study allows examination of potential changes in mothers' language use as they correspond to their children's ages.

Social context factors influencing caregivers' language use. Not only does the child's age or communication ability affect caregivers' language, but the specific context of the interaction is another proximal factor that also influences caregivers' language use. Certain contexts may encourage caregivers to use a greater amount of talk as well as alter the characteristics of their talk. During book sharing interactions in particular, mothers were observed to use more words, display greater vocabulary diversity, and produce more syntactically complex language than other contexts (Crain-Thoreson et al., 2001; Hoff-Ginsberg, 1991; Snow et al., 1976). Additionally, within book sharing interactions, mothers created routines or dialogues with language specific to these book sharing contexts (Ninio & Bruner, 1978; Snow & Goldfield, 1983). The use of social routines has been suggested as an

important contributor to communication development, and within the book sharing context, may serve as a vehicle to teach early language and literacy conventions (Bruner, 1981; Snow & Goldfield, 1983).

There is also evidence that the book sharing context promotes particular content in caregivers' language. Specifically, during book sharing sessions, mothers of 12 month old children engaged in greater discussion about items of joint focus and used more utterances relating objects or events in the book to the child's experiences than compared to toy play sessions (Yont, Snow, & Vernon-Feagans, 2003). Book sharing has been shown to promote several levels of parental language input, which is positively related to children's later abstract language abilities (van Kleeck et al., 1997). At the same time, the book sharing context may minimize language differences between mothers of varying income or education levels (Snow et al., 1976), since it offers a particular context and topic of interaction.

Given the potential for positively influencing caregivers' language use (and ultimately children's communication), book sharing appears to be a relevant context in which to examine caregivers' and children's language. Additionally, book sharing interactions may offer increased opportunity to examine caregivers' use of scaffolding and language strategies, since the activity itself offers a relatively specific topic and structure for the interaction. Consequently, the current investigation examines the influence of the proximal factor of social context on maternal language use within a book sharing interaction. By utilizing a common context, the current study allows detailed analysis of the potential variation in mothers' language use, while accounting for the social context of interaction.

Although there have been several studies that have examined the influence of book sharing interactions on language use by caregivers and preschool age children (e.g. van

Kleeck et al, 1997; Sénéchal, LeFevre, Thomas, & Daley, 1998; Whitehurst et al., 1988; Whitehurst et al., 1994), few studies have examined book sharing in a longitudinal design, beginning in infancy. Additionally, the studies that do analyze book sharing between mothers and infants have typically involved families from middle or upper socioeconomic levels (e.g. DeLoache & DeMendoza, 1987; van Kleeck et al., 1996; Ninio & Bruner, 1978). In contrast, the current study adds to the literature by examining book sharing interactions at two time points, with the same mothers and their children, who represent families with low incomes, living in rural environments.

Language Use within Caucasian Families from Low Income Environments

As reviewed, distal and proximal factors have influences on both caregivers' and children's language use. The following section will summarize the unique characteristics of the communication between parents and children within Caucasian families who have low incomes and often lower parental educational achievement.

Caregivers' Language Use in Low Income Environments

Several studies of Caucasian families living in low income environments have identified a great deal of variation in the amount of maternal talk and in maternal vocabulary diversity (Rowe et al., 2005; Tizard & Hughes, 1984). Additionally, parents from low income environments have been observed to use a number of language strategies, including forms of extended discourse, with their young children (Tabors, Roach, & Snow, 2001). Families with low income levels also provided home support for literacy by participating in activities that encouraged literacy development (Snow, Barnes, Chandler, Goodman, & Hemphill, 1991; Tabors, Roach, et al., 2001). In another study that highlighted the positive aspects of language use in low income environments, Tizard and Hughes (1984) documented

similarities between mainly Caucasian families of varying income levels in terms of their amount of talk, use of questions, and in the amount of "controlling" comments (both positive and negative forms of controlling utterances). However, the mothers from working-class environments produced less language for complex purposes and displayed lower vocabulary diversity in comparison to the mothers from middle-class environments (Tizard & Hughes, 1984). Other research suggests that Caucasian mothers with low socioeconomic status produced more behavioral directives and fewer topic-continuing utterances than mothers with higher socioeconomic status (Hoff-Ginsberg, 1991). Furthermore, in Heath's (1983) ethnographic research the Caucasian parents within low income environments adapted their talk to infants by simplifying words, using a slower rate of speech, and using names instead of pronouns. These adults also repeated children's sounds, linking these vocalizations to items in their environment (Heath, 1983). As children developed, these Caucasian parents verbally described activities to assist children with tasks and also encouraged children to attend to verbal language and to respond to questions (Heath, 1983). In addition, the Caucasian families frequently asked questions of young children in which the answer was known to the adult (Heath, 1983). These Caucasian parents appeared to believe that adults serve as the child's teacher prior to school and thus asked and modeled answers to questions if their child was not able to produce the expected response (Heath, 1983). Moreover, elaborate sequences of questions and answers have been observed within these Caucasian families from low income environments during book sharing interactions (Heath, 1983).

Children's Language Use in Low Income Environments

As with caregivers' language, there are distinctive aspects of Caucasian children's language use within low income environments. These children appear to use a variety of

language forms at different time points in their development, and their utterances reflect the use of question related communication from their parents (Anderson-Yockel & Haynes, 1994; Heath, 1983). However, Caucasian children within low income, rural environments had limited experience with storytelling or dramatic play (Heath, 1983). In fact Caucasian children were rarely encouraged to generate stories and when they did, the stories were expected to be factual and follow a specific sequence (Heath, 1983). Additionally, these Caucasian children from low income environments may have had basic print and literacy experiences, but often did not have as much experience with advanced literacy skills as the Caucasian children from middle-class environments (Heath, 1983). Consequently, children from low income environments typically had initial success with school readiness skills, as they may have been familiar with the forms of utterances utilized by their teachers, but displayed difficulties in later grades (Heath, 1983; Tizard & Hughes, 1984; Vernon-Feagans, 1996). Some research has indicated that Caucasian children within working-class environments asked fewer "why" questions, had a smaller vocabulary, and less frequently used language for complex purposes when compared to Caucasian children from middle-class environments (Tizard & Hughes, 1984). However, there is evidence that with familiar individuals and within their community contexts, children from low income environments produce more sophisticated language in terms of the structure and complexity of their sentences, in comparison to their language use at school (Heath, 1983; Tizard & Hughes, 1984; Vernon-Feagans, 1996). These findings emphasize the relevance of various aspects of context in descriptions of children's language abilities.

Summary and Research Questions

In conclusion, this review has discussed several aspects of children's early communication development, emphasizing the significant changes that occur within children's first years of life. Based on a theoretical framework that incorporates concepts from transactional, bioecological, socio-cultural, and interactionist perspectives, it is evident that caregiver and child communication may be affected by numerous factors. When examining caregivers' language, it appears that measures of the structural elements alone are insufficient in describing the influence of caregiver language on children's communication development. Rather, it is necessary also to consider the content of caregivers' language, as these characteristics of their verbal input may be important for the development of communication skills. Additionally, analyzing the content of caregivers' language typically reveals caregivers' scaffolding of their children's participation and learning. Parents' use of language strategies, representing different aspects of their support and scaffolding, are especially relevant in the context of caregiver-child book sharing interactions. Moreover, these findings argue for the need to document various features of caregivers' talk at several points in children's early development since there is some evidence for specific relationships between caregivers' language use and children's communication outcomes. Recognizing that both distal and proximal factors influence caregivers' language use and children's communication development, it is important to account for these factors, either through the selection of the sample or experimental control in the analyses. In particular, the distal factors of low income and rural environments, as well as maternal education contribute to both caregivers' language use and children's development. Although research exists that has examined the influence of maternal education level on development, there is limited research

that has considered the influence of low income and rural environments separately from maternal education. Proximal factors of the child's abilities and age, as well as the social context also influence the amount and type of language used by caregivers. Specifically, examination of caregivers' language use with their children at different developmental ages may identify changes in caregivers' use of language over time. Certain social contexts such as book sharing may be more relevant for the examination of caregivers' language as it appears to promote the use of various forms of complexity in caregivers' language. Thus, the current study integrates these findings and extends the research literature by examining both the structure and content of caregivers' language use with their young children at two distinct points in early development during book sharing interactions, in a sample of families from low income and rural environments.

The main objectives of the current investigation were to compare mothers' language use at two time points in early development and to identify possible relationships between mothers' language use and children's communication outcomes. More specifically, this investigation describes the language used by mothers during book sharing interactions at the level of structure and at the content level. *Structural* level variables represent the following components of maternal language: (a) amount of talk, (b) vocabulary diversity, and (c) length of utterance. *Content* level variables include eight different language strategies and the use of book or print conventions coded from the utterances utilized by mothers during the book sharing activity. For the current investigation, the term "primary caregivers" will be used interchangeably with "mothers", as all the primary caregivers for the children in this sample were their biological mothers. The current study addresses the following research questions.

1. Do primary caregivers vary their use of language when their children are 6 months of age in comparison to when their children are 15 months of age?

a) Are there differences in primary caregivers' use of structural level variables when their children are 6 months of age compared to when the children are 15 months of age? Where do the differences in primary caregivers' use of structural level variables exist?

b) Are there differences in primary caregivers' use of content level variables when their children are 6 months of age compared to when the children are 15 months of age? Where do the differences in primary caregivers' use of content level variables exist?

2. Which primary caregiver language variables at the 6 month time point are most strongly predictive of primary caregiver language use at 15 months, beyond the contributions of primary caregiver education at the 6 month time point and income-to-needs ratio at the 6 month time point?

a) What are the most important predictors of primary caregivers' number of different words (NDW) at the 15 month time point, beyond the contribution of education and income-to-needs ratio?

b) What are the most important predictors of primary caregivers' mean length of utterance in morphemes (MLUm) at the 15 month time point, beyond the contribution of education and income-to-needs ratio?

c) What are the most important predictors of primary caregivers' rate of use of Immediate Strategies at the 15 month time point, beyond the contribution of education and income-to-needs ratio?

d) What are the most important predictors of primary caregivers' rate of use of Elaborated Strategies at the 15 month time point, beyond the contribution of education and income-to-needs ratio?

3. Which aspects of primary caregivers' language use at the 6 month time point best predict children's communication abilities at the 15 month time point, beyond the contribution of education and income-to-needs ratio?

4. Which aspects of primary caregivers' language use at the 15 month time point best predict children's communication abilities at the 15 month time point, beyond the contribution of education and income-to-needs ratio?

The model presented in Figure 2.1 depicts the various relationships that were examined in the current investigation.

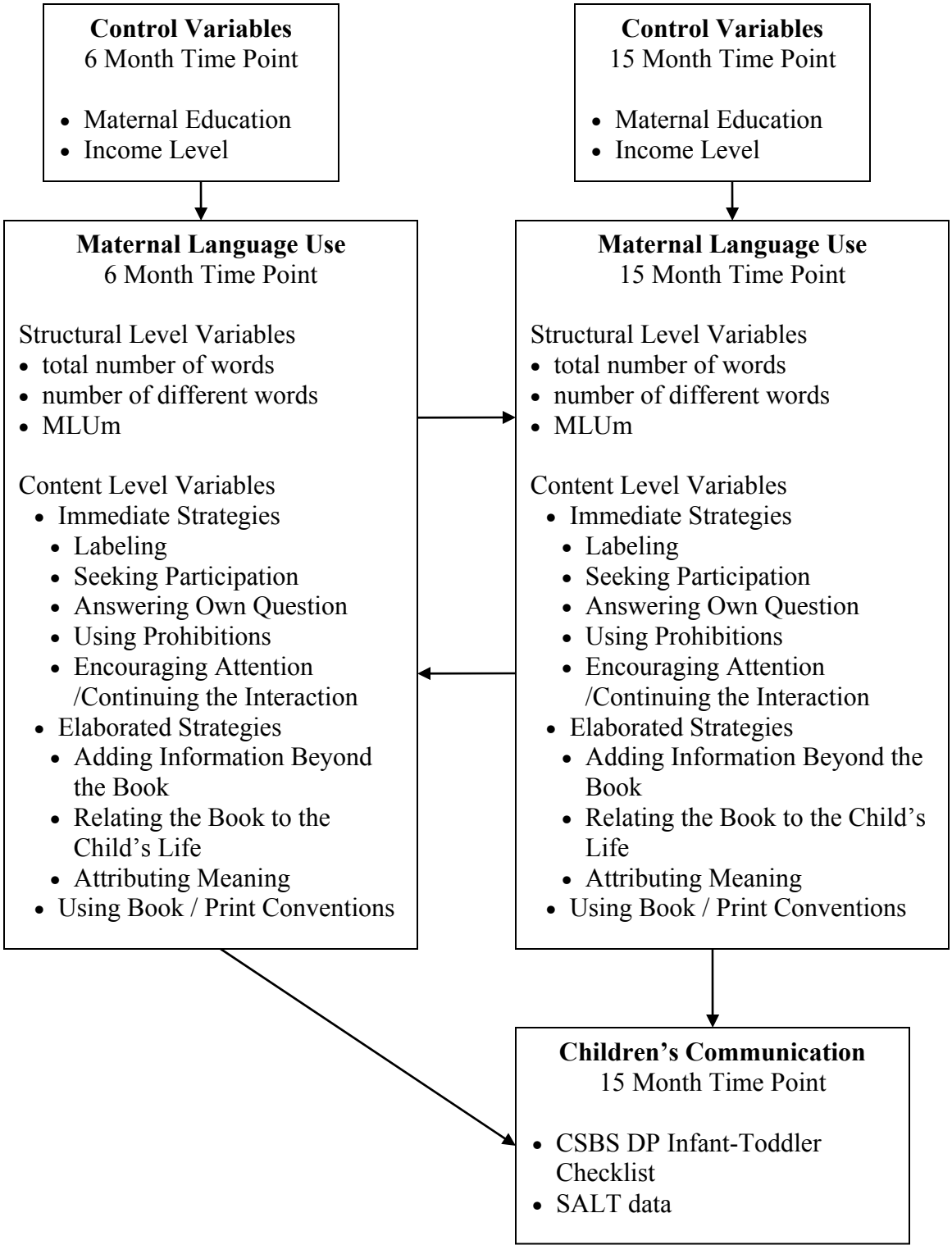

Figure 2.1. Model comparing maternal language use across time points and analyzing relationships between maternal language use and children's communication.

CHAPTER 3: METHODS

The children and caregivers in the current study were part of the Family Life Project (FLP), a larger, ongoing investigation under the direction of Dr. Lynne Vernon-Feagans. The FLP was designed to study families from two geographical areas of high child rural poverty, eastern North Carolina (NC) and central Pennsylvania (PA). The FLP investigators developed the overall research design, participant recruitment process and data collection procedures of the larger project. The current study looked at a sub-sample of the children and primary caregivers to examine differences in primary caregivers' language use at two time points and analyze relationships between primary caregivers' language use and children's communication outcomes.

Design and Recruitment for the Family Life Project (FLP)

The FLP adopted a developmental epidemiological design. Complex sampling procedures were used to recruit a representative sample of 1292 families at the time that they gave birth to a child. Families with low incomes in both states, and African-American families in NC were over-sampled, whereas African-American families were not over-sampled in PA, as the target communities were more than 95% Caucasian. Given logistical constraints related to obtaining family income data in the context of hospital screening, family income was dichotomized (low vs. not low) for the purposes of guiding recruitment. Families were designated as low income if they reported their household income was less than 200% of the poverty rate, used social services requiring a similar income requirement (e.g., food stamps, WIC, Medicaid), or the parent/s had less than a high school education.

In PA, families were recruited in person from three hospitals. These three hospitals represented a weighted probability sample (children in hospitals were sampled proportionally to the hospital size within the county) of seven total hospitals that delivered babies in the three target PA counties. Only three PA hospitals were sampled because the number of babies born in all seven target hospitals far exceeded the number needed for the purposes of the design. In NC, families were recruited in person and by phone. In-person recruitment occurred in all three of the hospitals that delivered babies in the target counties. Phone recruitment occurred for families who resided in target counties but delivered their babies in non-target county hospitals. These families were located through systematic searches of the birth records located in the county courthouses of nearby counties. At both sites, recruitment occurred seven days per week over the 12-month recruitment period spanning September 15, 2003 through September 14, 2004 using a standardized script and screening protocol.

In total, FLP recruiters identified 5471 (57% NC, 43% PA) women who gave birth to a child during the recruitment period, 72% of whom were eligible for the study. Eligibility criteria included residency in a target county, English as the primary language spoken in the home, and no intent to move from the area in the next three years. Of those eligible, 68% were willing to be considered for the study. Of those willing to be considered, 58% were invited to participate. Invitations for participation were based on sampling fractions that ensured a specific number of families were enrolled based on income level and race. From the invited families, 82% of families completed their first home visit when children were 2 months of age, at which point they were considered enrolled in the study, resulting in a total sample of 1292 participants. For more information regarding the FLP study design and recruitment refer to the Recruitment Summary (http://www.fpg.unc.edu/~flp/papers.cfm).

Sample Size for the Current Study

In order to determine the sample size for the current study, a general formula for multivariate research, N = 3kp was used, where N is the total sample size, k equals the number of groups, and p represents the number of variables (Huberty, 1994). In this study, k=2 since there were two groups representing two developmental time periods, and p=12 since there were twelve variables of interest. Using this formula, the estimate for sample size was 72. Additionally an analysis with the Power and Precision software program (Borenstein, Rothstein, & Cohen, 2001) indicated that with a sample of 80, and an expectation of a need to find a medium effect size, power was approximately .79. Thus, for this study, a sample size of 80 was targeted. The final sample size was 82.

Participant Characteristics for the Current Study

In an effort to minimize the external differences among participants for the current study, the target sample was defined based on several characteristics including state of residence, income level, child's age, completion of the book sharing activity, and race of the child and primary caregiver. Given that the focus of the current investigation was the primary caregivers' language use with their children, the sample only included primary caregivers and their children. Although the larger FLP included families from both PA and NC, in order to control for site differences, only PA was selected for inclusion in the present study. As one characteristic of interest, family income level was an inclusion criterion for the larger FLP investigation. In particular, the FLP utilized an income-to-needs ratio to describe family financial resources. An income-to-needs ratio was calculated based on the federal poverty level specific to the size and composition of the family, and total family income. An income-to-needs ratio of 1.0 indicated that the family's income level was the

same as the federal poverty level (100% of the poverty level), whereas families who had income-to-needs ratios of 2.0 had incomes that were at 200% of the poverty level. In the current investigation, participants with income-to-needs ratios of less than 2.0 at both the time points of data collection were chosen to represent a sample that had experienced a persistent low income environment during this developmental period.

The sample for the current study was also defined based on the age range of the target child during the book sharing task. As the focus of this investigation was on the primary caregiver's language use with their child at very young ages, and children's development changes rapidly at early ages, it was important to minimize large age differences within each time point of data collection. For this reason, the families who were included in the current study had children who were between 5.5 months to 7.5 months of age at the 6 month data collection time point, and these children were between 14.5 months to 16.5 months of age at the 15 month data collection time point. Additionally, it was necessary to exclude a few families who did not complete the book sharing task at both time points, as the nature of the research questions required data from both developmental time points. Finally, for experimental control, the race of the primary caregiver and child was also selected based on the majority race evident in the PA sample, which was Caucasian. Thus, participants were identified from primary caregivers and their children from PA who had income-to-needs ratios of less than 2.0 at both time points, with children who were within the specified age ranges, who completed the book sharing task at both time points, and who were Caucasian. From the resulting 113 families, 82 were randomly selected for inclusion in the current investigation of primary caregivers' language use with their children during a book sharing interaction. General characteristics regarding the participants are reported in Table 3.1.

Table 3.1

Characteristics of Primary Caregivers and Children at 6 and 15 Month Time Points (N = 82)

Participant Characteristics	**%**	**Mean**	**SD**	**Range**
Primary Caregiver Demographics				
Gender (% Female)	100			
Relationship to Child (% Biological Mother)	100			
Race (% White)	100			
6 month time point				
Age (Years)		25.88	6.60	15.96–44.41
Education - % Without High School/GED	21.95			
Education - % Completion of High School/GED	40.24			
Education - % Additional Education, No Degree	25.61			
Education - % Associate's degree	4.88			
Education - % 4 Year College Degree	3.66			
Education - % Post-college, Professional/Graduate	3.66			
Employment (% Employed)	40.24			
Marital Status (% Married)	42.68			
15 month time point				
Age (Years)		26.60	6.60	16.60–45.06
Education - % Without High School/GED	18.29			
Education - % Completion of High School/GED	40.24			

Education - % Additional Education, No Degree	29.27			
Education - % Associate's degree	4.88			
Education - % 4 Year College Degree	3.66			
Education - % Post-college, Professional/Graduate	3.66			
Employment (% Employed)	41.46			
Marital Status (% Married)	42.68			
Child Demographics				
Gender (% Female)	51.22			
Race (% White)	100			
6 month time point				
Age (Months)		6.54	0.49	5.65–7.46
Children with Secondary Caregivers (%)	80.48			
Childcare (% In Child Care)	67.07			
15 month time point				
Age (months)		15.17	0.38	14.55–16.33
Children with Secondary Caregivers (%)	82.93			
Childcare (% In Child Care)	57.32			
Income-to-Needs Ratio at 6 month time point		1.07	.54	0–1.99
Income-to-Needs Ratio at 15 month time point		1.09	.52	0–1.98

As evident from Table 3.1, all the primary caregivers in the present study were female and were the biological mothers of their children. At both time points, approximately 43% of

the mothers were married. Maternal education level at both the time points ranged from values representing less than a high school degree to achievement of a professional degree or PhD. In terms of education attainment, approximately 22% of the mothers did not have a high school degree, and 40% had completed only high school or a GED. Mothers who reported some education beyond high school, but without additional degrees represented about 26% of the sample. Those with an Associate's degree comprised approximately 5% of the sample. Therefore, there were only 7% of the mothers in this sample with a college degree, a professional degree, or additional education beyond college. Similar data were reported for maternal education level at the 15 month time point, with a few individuals increasing their education such that mothers with education beyond high school without completion of a degree represented approximately 29% of the sample (compared to 26% of the sample at the 6 month time point). Approximately 40% of the mothers had employment when these data were collected. In terms of child characteristics, there was a fairly even representation of gender, with female children comprising approximately 51% of the sample. Additionally, approximately 80% of the children at the 6 month time point had a secondary caregiver, and 83% of the children had a secondary caregiver at the 15 month time point. Of the secondary caregivers, 80-85% represented the biological parent (father) of the child, and the remaining secondary caregivers were either a grandparent, a partner to the mother, or an unrelated adult. A majority of children were in childcare at both time points, with 67% at the 6 month time point, and approximately 57% receiving childcare at the 15 month time point. Income-to-needs ratios were all less than 2.0 as selected by the design of the study, and at the 6 month time point ranged from 0 to 1.99, and from 0 to 1.98 at the 15 month time point.

Mean values of approximately 1.0 at both time points indicated that on average these families reported incomes that were at the federal poverty level.

Procedures for the FLP

Data collection for the FLP occurred during home visits at specific developmental time periods based on the children's ages and the goals of the larger study. For the purposes of the current study, the visits of interest took place when the children were approximately 6 months and 15 months of age, consequently the procedures of these time points will be reviewed. At the home visits, there were typically two home visitors who collected data based on interviews, questionnaires, interactions between the caregivers and children, as well as child assessment tasks. Interaction activities were filmed with a DVD camera with an internal microphone and another wireless microphone was either worn by participants or placed near the interaction area. The FLP interaction activities included free play tasks, emotion-eliciting challenge tasks, and a book sharing task. Additional physiological data were also collected on each child, such as heart rate, saliva samples, and measurements of growth.

Although other activities took place between children and their caregivers as part of the larger FLP, in the current study, the book sharing activity with primary caregivers was the interaction task of interest. Primary caregivers and children were filmed in their homes during a book sharing interaction when children were age 6 months and later at age 15 months. At each of the two time points, a wordless picture book was presented corresponding to the interests of children at that particular age. At the 6 month time point, the book *Baby Faces* (1998) was adapted by removing the text on each page. At the 15 month time point, the book *No David!* (Shannon, 1998) was modified by slightly altering the

features of the main character in the illustrations to reduce the appearance of a single ethnicity, removing the text on each page, and by removing a few pages from the overall story. Both books had text printed on the cover. Primary caregivers were provided an opportunity to preview the book prior to the actual book sharing interaction. At the beginning of the book sharing activity, the home visitors asked the primary caregiver to go through the book with their child in the caregiver's typical manner. There was no specific time period for the interaction and primary caregivers were told to indicate when they were finished with the activity. Primary caregivers were able to determine the duration of the interaction. Consequently there were interactions of less than one minute to a maximum of ten minutes, as the home visitors were instructed to stop filming the task when the caregivers signaled that it was over, or after documenting no more than ten minutes of interaction.

Previous approval from the Office of Human Research Ethics Internal Review Board (IRB) for the larger project had been received prior to data collection. Additional IRB approval was obtained for secondary data analyses conducted as part of the current investigation.

Data Collection Measures & Instruments for the FLP

As part of the larger FLP investigation, home visitors collected demographic information on the families at the time of the child's birth and updated this information at each home visit as necessary. From the information gathered in these visits, measures of maternal education and family income-to-needs ratio were obtained. Maternal education was documented at both the 6 month and 15 month time points. Mothers' education attainment was described along a scale, with the value of 1 representing less than an 8th grade education, and a value of 9 representing a professional degree or Ph.D. The income-to-needs ratios

were also calculated at both time points of interest in the current study, and were based on annual household total income and the federal poverty threshold specific to the family size. For this study, to identify families with persistent low incomes, families were selected who had income-to-needs ratios below 2.0 at both the 6 month and 15 month visits.

Children's early communication abilities were assessed with the *Communication and Symbolic Behavior Scales Developmental Profile Infant-Toddler Checklist* (*CSBS DP Infant-Toddler Checklist*; Wetherby & Prizant, 2002). The *CSBS DP Infant-Toddler Checklist* is one component of the *CSBS DP* (Wetherby & Prizant, 2002) screening and assessment tool. It was completed by the primary caregiver and provided information regarding several aspects of communication development. Specifically, the *CSBS DP Infant-Toddler Checklist* measures the abilities of children in seven areas: Emotion and Eye Gaze, Communication, Gestures, Sounds, Words, Understanding, and Object Use. It was designed to be used with children ages 6 to 24 months and can be utilized reliably and independently of the other components of the *CSBS DP*. The *Infant-Toddler Checklist* consists of 24 multiple-choice questions that were completed by the primary caregiver either independently or in an interview format. Results are summarized by adding raw scores for each area and generating three Composite scores and a Total score. The Social Composite score is determined by summing the Emotion and Eye Gaze, Communication, and Gestures raw scores. The Speech Composite Score is based on the sum of the raw scores from Sounds and Words. The Symbolic Composite Score is the sum of the raw scores of Understanding and Object Use. Finally the Total raw score is generated from all seven raw scores. Additionally, standard scores are provided for each Composite score and the Total score. Normative data for the *Infant-Toddler Checklist* is presented in the *CSBS DP* manual in one month intervals and is

based on 2188 children from culturally diverse groups. According to the *CSBS DP* manual, standard scores for Composite Scores are based on a mean of 10 and standard deviation of 3 and the standard score for the Total Score is based on a mean of 100 and a standard deviation of 15.

Data Collection Measures for the Current Study

The focus of data collection for the current study was the language used by the primary caregivers and their children during the book sharing interactions. The present study included two phases of data analysis related to the language utilized in the book sharing interactions. The first included systematic transcription of both primary caregiver and child language use. The second phase involved coding the primary caregiver's use of language strategies.

Transcription of book sharing interactions. The language produced by primary caregivers and their children during both book sharing interactions was entered into text files using the computer software program the Systematic Analysis of Language Transcripts Research Version 8.0 (SALT; Miller & Chapman, 2004). All book sharing interactions were viewed by the project coordinator or research assistants and transcripts were created in the SALT program. All transcribers had undergone training in SALT by a senior graduate assistant who had previously learned SALT protocols and had developed the training manual. As part of the training process, each transcriber reviewed the training manual and transcribed 20 training book sharing interactions. The resulting transcripts were reviewed by the senior graduate student prior to beginning official transcription of the book sharing task. Additionally, at least 10 subsequent transcripts were reviewed by the senior graduate student to monitor transcription consistency. Transcribers met regularly to discuss any questions

regarding SALT conventions or the transcription process. Once SALT transcripts were created, the SALT program provided the basis for the initial phase of data analysis. From the data available in this phase, *structural* level variables of the primary caregiver's language use were examined. These structural level variables included: (a) the total number of words, (b) the number of different words, and (c) the mean length of utterance in morphemes (MLUm). These specific elements of language use were selected for the present study because they have been related to children's communication abilities in previous research (e.g. Bornstein et al., 1998; Hart & Risley, 1995; Hoff, 2003; Huttenlocher et al., 1991, Pan et al., 2005).

The children's language use and communication during the book sharing activity were documented within the SALT transcripts only at the 15 month time point, because at 6 months the children were not yet using verbal communication. Children's communication at 15 months in the form of words, unintelligible utterances, and specific gestures were transcribed. From these components, SALT analyses were conducted to document the total number of communicative attempts, the number of different words, and the total number of gestures used by each child.

Coding system. In the second phase of data collection, the *content* of each primary caregiver's language was examined to document their use of language strategies. These content level variables representing language strategies were classified into Immediate Strategies and Elaborated Strategies. Additionally, the primary caregiver's use of language that reflected information about book or print conventions was coded as Using Book or Print Conventions. For the current study, Immediate Strategies were defined as those utterances that utilized more concrete language and included less abstract language, similar to the work of other researchers (e.g. Blank, Rose, & Berlin, 1978; DeTemple, 2001; Snow, 1991; van

Kleeck et al., 1997). Immediate strategies relied on referents that were immediate or present in the environment. In this study, the following types of utterances were classified as Immediate Strategies: (a) Labeling, (b) Seeking Participation, (c) Answering Own Question, (d) Using Prohibitions, and (e) Encouraging Attention and Continuing the Interaction. In contrast, Elaborated Strategies, as defined for the purposes of this study, were those utterances that required more abstract language and required additional information to what was available from the pictures within the book. This definition was based on similar definitions in the literature (e.g. Blank et al., 1978; DeTemple, 2001; Snow, 1991, van Kleeck et al. 1997). In the current study, the following behaviors were considered Elaborated Strategies: (a) Adding Information Beyond the Book, (b) Relating the Book to Child's Life, and (c) Attributing Meaning to Child Action or Behavior. The individual codes within the categories of Immediate or Elaborated Strategies were created to represent several aspects of the content of primary caregivers' language use and included adaptations of codes that had been previously documented within the research literature (e.g. (DeLoache & DeMendoza, 1987; Ninio & Bruner, 1978; Roberts et al., 2005; van Kleeck et al., 1996; van Kleeck et al., 1997). Detailed definitions and examples of the Immediate Strategies, Elaborated Strategies, and Using Book or Print Conventions are provided in the Coding Manual created for this project, and available in Appendix A. As described in the Coding Manual, only complete and intelligible utterances produced by the primary caregivers were considered for coding. In addition, a few primary caregiver utterances that were clearly directed at others (not the participating child) were not analyzed, and on average these represented less than 5% of the complete and intelligible utterances in each transcript.

Coding Process and Reliability for the Current Study

Prior to coding, the transcripts were randomized (across children) based on individual identification numbers and subsequently were coded based on the order indicated by the randomization process. All transcripts were coded by the author of the current study and for each primary caregiver-child dyad the 6 month transcript was coded prior to the 15 month transcript. A research assistant with an undergraduate degree in Psychology was recruited to assist in establishing inter-rater reliability of the coding system. This research assistant was employed by the larger FLP investigation and had been trained previously in SALT transcription. Throughout the training and reliability coding process, both books utilized in the home visits were available to the research assistant. Training for the research assistant was initiated by reviewing the procedures and examples described in the Coding Manual (see Appendix A). Definitions for the codes and a sample transcript that had been coded were discussed. In the first phase of training, transcripts from non-study families, but with some similar characteristics to those in the current study were selected for coding. These initial ten transcripts, representing both the 6 month and 15 month book sharing interactions were coded independently by both the research assistant and the author, and subsequently each code on every transcript was discussed. During this initial phase, definitions were clarified and additional examples generated to assist with coding decisions. In the next phase, the research assistant and the author independently coded an additional 8 transcripts, with general discussion about patterns of disagreements. Prior to beginning actual reliability coding, kappa coefficients were above 0.70 across the transcripts and codes. As a result of the training process, revisions were made to the Coding Manual to add detailed examples of each code with specific examples generated from the transcripts. These documents were

provided to the research assistant before actual reliability coding occurred. Transcripts for reliability coding were randomly selected from the sample of 82 families in the current study. There were 18 sets of book sharing transcripts selected, such that 18 transcripts at the 6 month time point and the corresponding 18 transcripts from the same participants at the 15 month time point were chosen. In this way, reliability coding occurred on both the 6 month transcript and the 15 month transcript for each of the 18 sets of participants.

Both the research assistant and the author independently coded the 18 sets of transcripts (a total of 36 transcripts were coded by each person), representing approximately 22% of the transcripts utilized in the current study. Inter-rater reliability was calculated using Cohen's kappa statistic (Cohen, 1960) as described in Bakeman and Gottman (1997). The kappa statistic is a measure of observer agreement that corrects for the proportion of agreement expected by chance (Cohen, 1960). Therefore, the kappa statistic is preferable to using only the proportion of agreement observed. Fleiss (1981) indicates that kappa coefficients of over 0.75 represent excellent agreement beyond chance.

The summary kappa statistics for all transcripts and for each time point are provided in separate tables identified as Tables 3.2, 3.3 and 3.4. Due to the nature of the coding process, several kappa statistics were calculated and reported within each table. First, the kappa statistics (referred to as Kappa Language in Tables 3.2, 3.3, and 3.4) were generated that considered only the language strategies. As the Using Book or Print Conventions code was always used in addition to a language strategy, a separate kappa statistic (Kappa Book in Tables 3.2, 3.3, and 3.4) was computed. The third form of kappa calculated (Kappa Overall in Tables 3.2, 3.3, and 3.4) accounted for both the language strategies and the code for book or print conventions. The average kappa statistics across all the transcripts and components

coded were all above 0.85. According to the criteria proposed by Fleiss (1981), this value represents excellent agreement beyond what would be expected by chance.

Table 3.2

Summary of kappa Statistics at both the 6 and 15 Month Time Points

Number	**ID number**	**Kappa Language**	**Kappa Book** [a]	**Kappa Overall**
1a	6267PBP06	0.9427	0.6463	0.9408
1b	6267PBP15	0.7935	1.0000	0.8964
2a	5625PBP06	0.9287	-	0.9667
2b	5625PBP15	0.9149	0.6526	0.9336
3a	5711PBP06	0.9053	1.0000	0.9542
3b	5711PBP15	1.0000	1.0000	1.0000
4a	5682PBP06	0.8808	1.0000	0.9357
4b	5682PBP15	0.9579	0.9012	0.9689
5a	6008PBP06	0.9354	1.0000	0.9686
5b	6008PBP15	0.9516	-	0.9496
6a	6134PBP06	0.8482	1.0000	0.9211
6b	6134PBP15	0.8732	0.9028	0.9196
7a	5859PBP06	0.9652	0.8551	0.9494
7b	5859PBP15	0.7881	1.0000	0.9086
8a	5679PBP06	0.8583	0.6510	0.8989
8b	5679PBP15	0.8567	0.8459	0.9114
9a	6039PBP06	0.9207	0.8466	0.9446

9b	6039PBP15	0.7959	1.0000	0.9008
10a	5563PBP06	0.8921	1.0000	0.9447
10b	5563PBP15	0.8648	0.7478	0.9014
11a	6213PBP06	0.8700	-	0.9379
11b	6213PBP15	0.9417	-	0.9616
12a	6377PBP06	0.9553	0.9459	0.9694
12b	6377PBP15	0.8021	0.8785	0.8821
13a	5392PBP06	0.8443	0.8221	0.9022
13b	5392PBP15	0.8335	0.7363	0.8930
14a	5255PBP06	0.9213	0.8503	0.9518
14b	5255PBP15	0.8517	1.0000	0.9299
15a	6318PBP06	0.8800	0.9029	0.9217
15b	6318PBP15	0.9463	0.6584	0.9597
16a	5348PBP06	1.0000	1.0000	1.0000
16b	5348PBP15	0.9141	1.0000	0.9592
17a	6096PBP06	0.9484	0.8679	0.9518
17b	6096PBP15	0.9417	1.0000	0.9722
18a	6343PBP06	0.9066	0.6977	0.9107
18b	6343PBP15	0.8891	0.8534	0.9350
Average		0.8978	0.8832	0.9378

Note. Rows with "a" as part of the Number represent 6 month data and rows with "b" represent the 15 month data.

[a] Empty cells in the column indicate no Using Book or Print Conventions codes

Table 3.3

Summary of kappa Statistics at the 6 Month Time Point

Number	ID number	Kappa Language	Kappa Book [a]	Kappa Overall
1a	6267PBP06	0.9427	0.6463	0.9408
2a	5625PBP06	0.9287	-	0.9667
3a	5711PBP06	0.9053	1.0000	0.9542
4a	5682PBP06	0.8808	1.0000	0.9357
5a	6008PBP06	0.9354	1.0000	0.9686
6a	6134PBP06	0.8482	1.0000	0.9211
7a	5859PBP06	0.9652	0.8551	0.9494
8a	5679PBP06	0.8583	0.6510	0.8989
9a	6039PBP06	0.9207	0.8466	0.9446
10a	5563PBP06	0.8921	1.0000	0.9447
11a	6213PBP06	0.8700	-	0.9379
12a	6377PBP06	0.9553	0.9459	0.9694
13a	5392PBP06	0.8443	0.8221	0.9022
14a	5255PBP06	0.9213	0.8503	0.9518
15a	6318PBP06	0.8800	0.9029	0.9217
16a	5348PBP06	1.0000	1.0000	1.0000
17a	6096PBP06	0.9484	0.8679	0.9518
18a	6343PBP06	0.9066	0.6977	0.9107

Average	0.9113	0.8804	0.9428

[a] Empty cells in the column indicate no Using Book or Print Conventions codes

Table 3.4

Summary of kappa Statistics at the 15 Month Time Point

Number	ID number	Kappa Language	Kappa Book [a]	Kappa Overall
1b	6267PBP15	0.7935	1.0000	0.8964
2b	5625PBP15	0.9149	0.6526	0.9336
3b	5711PBP15	1.0000	1.0000	1.0000
4b	5682PBP15	0.9579	0.9012	0.9689
5b	6008PBP15	0.9516	-	0.9496
6b	6134PBP15	0.8732	0.9028	0.9196
7b	5859PBP15	0.7881	1.0000	0.9086
8b	5679PBP15	0.8567	0.8459	0.9114
9b	6039PBP15	0.7959	1.0000	0.9008
10b	5563PBP15	0.8648	0.7478	0.9014
11b	6213PBP15	0.9417	-	0.9616
12b	6377PBP15	0.8021	0.8785	0.8821
13b	5392PBP15	0.8335	0.7363	0.8930
14b	5255PBP15	0.8517	1.0000	0.9299
15b	6318PBP15	0.9463	0.6584	0.9597
16b	5348PBP15	0.9141	1.0000	0.9592

17b	6096PBP15	0.9417	1.0000	0.9722
18b	6343PBP15	0.8891	0.8534	0.9350
Average		0.8843	0.8861	0.9324

[a] Empty cells in the column indicate no Using Book or Print Conventions codes

CHAPTER 4: RESULTS

The primary aims of this investigation were to examine primary caregivers' language use during book sharing interactions at two early time points in children's development and analyze relationships between caregivers' use of language and children's communication outcomes. Specifically, it was of interest to identify potential differences in primary caregivers' language use over time and to determine which aspects of their language use were most important in predicting children's communication at the 15 month time point. Unless otherwise noted, all statistical analyses were completed using SAS (version 8.2).

Descriptive Statistics

As a preliminary step in examining the data, descriptive statistics were obtained for all variables of interest related to the primary caregivers' language use at both the 6 month and 15 month time points and children's outcomes at the 15 month time point. In this sample all the primary caregivers were the biological mothers of the children involved in the study. Therefore, the terms "primary caregivers" and "mothers" are utilized interchangeably to represent the adult participants of the current study. Primary caregivers' language use was described by structural level variables and content level variables. Structural level variables were: (a) the total number of words (NTW), (b) the number of different words (NDW), and (c) the mean length of utterance in morphemes (MLUm). Content level variables specific to this study included: (a) mothers' use of language strategies (8 different codes) and (b) mothers' use of book or print conventions (1 code). Additionally, descriptive statistics also

were obtained for maternal education and the family's income-to-needs ratio, as they were utilized as control variables for some analyses.

Structural Level Variables

First, univariate analyses were conducted to examine the frequency distributions, means, and standard deviations of each structural level variable. At both the 6 month and 15 month time points, the structural level variables for NDW and MLUm approximated a normal distribution, based on inspection of tests of normality, histograms, and Q-Q plots. The variable representing NTW, however, approximated the normal distribution at the 6 month time point, but displayed greater skewness and kurtosis than expected for a normal distribution at the 15 month time point. Means, standard deviations, and ranges for the structural level variables at the 6 and 15 month time points are reported in Tables 4.1 and 4.2, respectively. The mothers in this sample displayed great variability in their use of NTW and NDW, and this variability was most pronounced at the 15 month time point. These univariate analyses suggest that both NDW and MLUm are structural level variables with approximately normal distributions, as required for some of the subsequent multivariate analyses.

Table 4.1

Descriptive Statistics for Maternal Language Use at the 6 Month Time Point (N=82)

Measures at 6 Month Time Point	**Mean**	**SD**	**Range**
Structural Level Variables			
Number of Total Words	181.48	96.49	9 – 496
Number of Different Words	67.18	26.82	9 – 160
Mean Length of Utterance in Morphemes	2.94	0.50	1.8 – 4
Content Level Variables			
Maternal Complete and Intelligible Utterances	65.71	33.47	4 - 176
Immediate Strategies			
Labeling	15.30	8.82	0 – 43
Seeking Participation	5.46	4.45	0 – 17
Answering Own Question	0.41	0.86	0 – 5
Using Prohibitions	2.29	3.68	0 – 19
Encouraging Attention and Continuing the Interaction	26.90	16.23	0 – 86
Elaborated Strategies			
Adding Information Beyond the Book	6.18	4.87	0 – 19
Relating the Book to Child's Life	3.78	3.75	0 – 13
Attributing Meaning to Child Action or Behavior	3.22	3.17	0 – 15
Using Book or Print Conventions	4.06	4.03	0 – 22

Sum of Immediate Strategies [a]	49.96	26.54	1 – 137
Sum of Elaborated Strategies	13.18	8.83	0 – 34
Control Variables			
Maternal Education [b]	3.43	1.33	2 – 9
Income-to-Needs Ratio	1.07	0.54	0 – 1.99

[a] Sum of Immediate Strategies does not include values from Answering Own Question due to the limited occurrence of this individual code as described in the body of this chapter.

[b] Maternal Education Level was documented as follows: (a) 1 = 8th grade or less; (b) 2 = high school but no degree; (c) 3 = high school degree or GED; (d) 4 = some college or additional training, but no degree; (e) 5 = Associate's degree; (f) 6 = 4-year college degree; (g) 7 = some post-college work, no advanced degree; (h) 8 = Master's degree; and (i) 9 = Professional degree or Ph.D.

Table 4.2

Descriptive Statistics for Maternal Language Use at the 15 Month Time Point (N=82)

Measures at 15 Month Time Point	**Mean**	**SD**	**Range**
Structural Level Variables			
Number of Total Words	190.17	127.17	12 – 776
Number of Different Words	75.07	34.11	9 – 187
Mean Length of Utterance in Morphemes	2.89	0.61	1.17 – 5.29

Content Level Variables			
Maternal Complete and Intelligible Utterances	70.18	42.11	7 - 262
Immediate Strategies			
Labeling	19.24	13.94	1 – 79
Seeking Participation	10.13	9.68	0 - 62
Answering Own Question	0.83	1.32	0 - 5
Using Prohibitions	2.04	2.42	0 - 15
Encouraging Attention and Continuing the Interaction	27.21	14.96	5 – 75
Elaborated Strategies			
Adding Information Beyond the Book	4.13	6.07	0 - 40
Relating the Book to Child's Life	2.41	2.99	0 - 16
Attributing Meaning to Child Action or Behavior	1.67	2.38	0 - 14
Using Book or Print Conventions	5.50	5.43	0 - 32
Sum of Immediate Strategies [a]	58.62	35.66	6 – 217
Sum of Elaborated Strategies	8.22	8.25	0 - 48
Control Variables			
Maternal Education [b]	3.50	1.31	2 – 9
Income-to-Needs Ratio	1.09	0.52	0 – 1.98

[a] Sum of Immediate Strategies does not include values from Answering Own Question due to the limited occurrence of this individual code occurrence as described in the body of this chapter.

[b] Maternal Education Level was documented as follows: (a) 1 = 8th grade or less; (b) 2 = high school but no degree; (c) 3 = high school degree or GED; (d) 4 = some college or additional training, but no degree; (e) 5 = Associate's degree; (f) 6 = 4-year college degree; (g) 7 = some post-college work, no advanced degree; (h) 8 = Master's degree; and (i) 9 = Professional degree or Ph.D.

Content Level Variables

Next, the content level variables were examined with similar univariate methods. Tables 4.1 and 4.2 display the means, standard deviations, and ranges for all content level variables at the 6 and 15 month time points, respectively. As previously described, primary caregivers' utterances that were complete and intelligible were coded, and those that were interrupted or that included unintelligible words were not coded. The data indicate a dramatic increase in the range of complete and intelligible utterances produced by mothers from the 6 month to 15 month time point (range of 4 to 176 utterances at the 6 month time point and range of 7 to 262 utterances at the 15 month time point). In addition it was noteworthy that the content codes with the highest means at both time points were "Encouraging Attention and Continuing the Interaction" and "Labeling". These codes also displayed wide ranges within each time point. However, the code with the lowest means at both time points was the code for "Answering Own Question." For the purposes of description, proportions of several of the content level codes were calculated by dividing the number of occurrences of the specific code by the number of complete and intelligible utterances. It was determined that

approximately 39% of the utterances in mothers' talk received a code of Encouraging Attention and Continuing the Interaction and 24% of their utterances received a code of Labeling at the 6 month time point. Likewise, at the 15 month time point, these proportions were very comparable (40% for Encouraging Attention and Continuing the Interaction and 26% for Labeling). The code for Answering Own Question displayed the lowest proportion of use at both time points.

When examining the descriptive statistics of other content level variables, there were narrower ranges of values noted at both time points for Using Prohibitions, Adding Information Beyond the Book, Relating the Book to the Child's Life, and Attributing Meaning. Although the code of Seeking Participation had a narrow range of values at the 6 month time point, it displayed a greater range of values at the 15 month time point. Due to the limited use of some codes by some mothers, several of the content level variables at both time points had distributions that were positively skewed (tails extended towards higher values). In particular, examination of the frequency distribution for the code of Answering Own Question indicated that the interactions of approximately 74% of the primary caregivers at the 6 month time point and approximately 60% of the primary caregivers at the 15 month time point did not include this code. Given that the majority of participants at both time points did not use this form of utterance during the book sharing interactions, and that the range of observed values was limited for this code (range was from 0 to 5), Answering Own Question was not included in subsequent analyses. Several individual content level variables approximated the normal distribution, but some did not appear to meet this criterion. In general, normality of distribution was not a requirement for the multivariate analyses that utilized the individual content variables.

Composites and Rates of Content Level Variables

To obtain another perspective on the data, the language strategies were classified into Immediate Strategies and Elaborated Strategies, based on the individual code. For the purposes of data analyses, composite variables were created to represent the sum of the Immediate Strategies and the sum of the Elaborated Strategies for each primary caregiver at both time points. As reported, the code Answering Own Question was used only by a small proportion of the sample and displayed a limited range of values. Consequently, the code Answering Own Question was not included in the composite variable representing the sum of Immediate Strategies.

The sum of Immediate Strategies at each time point was calculated by adding together each of the following individual strategies at the appropriate time point: a) Labeling, (b) Seeking Participation, (c) Using Prohibitions and (d) Encouraging Attention and Continuing the Interaction. Similarly, the sum of Elaborated Strategies at each time point was generated by adding together each of the following individual strategies at the appropriate time point: (a) Adding Information Beyond the Book, (b) Relating the Book to Child's Life, and (c) Attributing Meaning to Child Action or Behavior. Means, standard deviations, and ranges for the composite variables representing the sum of Immediate and Elaborated Strategies are reported in Table 4.1 and 4.2 for the 6 and 15 month time points, respectively.

At both time points, due to the design of the larger FLP investigation, families participated in the book sharing interaction for varying lengths of time. The duration of the book sharing task at the 6 month time point was on average 160 seconds (rounded to nearest second), with a minimum duration of 70 seconds and maximum duration of 299 seconds. At

the 15 month time point, the duration of the book sharing task was on average 158 seconds, with a minimum duration of 32 seconds and maximum duration of 602 seconds. The variation in duration of the book sharing task may have influenced both the total use of each code at different time points within a family as well any analyses looking at each code across participating families. To remove the potential influence of varying durations, the rate per second of use of language strategies was calculated for all individual language strategies and for the code representing the use of book or print conventions. These variables were computed by dividing the total occurrences of a specific code by the duration of the interaction in seconds at the specific time point. For example, for each primary caregiver, the variable representing the rate of Labeling at the 6 month time point was computed by taking the total of the Labeling code at 6 months for a particular primary caregiver and dividing it by the number of seconds of the book sharing task for this particular primary caregiver at 6 months. This generates a variable for the rate of Labeling for each primary caregiver at the 6 month time point. Rate of use of each individual code was computed in this manner at both the 6 and 15 month time points. Composite rate variables for Immediate Strategies at each time point were calculated by dividing the sum of Immediate Strategies by the duration of the book sharing interaction, using values specific to each time point. This process generated a variable at each time point that represented mothers' rate of use of all Immediate Strategies, and will be referred to as the rate of use of Immediate Strategies.

Using comparable procedures, composite rate variables for Elaborated Strategies at each time point were calculated, representing at each time point mothers' rate of use of all Elaborated Strategies. At each time point the composite rate variable for Elaborated Strategies will be referred to as the rate of use of Elaborated Strategies. Table 4.3 provides

means, standard deviations, and ranges for the individual and composite rate variables at the 6 month time point with comparable information in Table 4.4 for the 15 month time point. Rates of all the individual content level codes were utilized in analyses examining potential differences in maternal language use at the 6 month and 15 month time points.

Table 4.3

Descriptive Statistics for Maternal Rate of Use of Content Level Variables (per second) at the 6 Month Time Point (N=82)

Measures at 6 Month Time Point	**Mean**	**SD**	**Range**
Content Level Variables			
Immediate Strategies			
Rate of Labeling	0.097	0.048	0 - 0.242
Rate of Seeking Participation	0.035	0.029	0 - 0.147
Rate of Answering Own Question	0.003	0.006	0 - 0.027
Rate of Using Prohibitions	0.014	0.021	0 - 0.113
Rate of Encouraging Attention and Continuing the Interaction	0.168	0.086	0 - 0.436
Elaborated Strategies			
Rate of Adding Information Beyond the Book	0.038	0.027	0 - 0.101
Rate of Relating the Book to Child's Life	0.023	0.020	0 - 0.074
Rate of Attributing Meaning to Child Action or Behavior	0.020	0.020	0 - 0.106
Rate of Using Book or Print Conventions	0.025	0.021	0 - 0.086

Rate of Use of Immediate Strategies [a]	0.313	0.132	.011 – .604
Rate of Use of Elaborated Strategies	0.081	0.045	0 – 0.2

[a] Rate of use of Immediate Strategies does not include values from Answering Own Question due to the limited occurrence of this individual code as described in the body of this chapter.

Table 4.4

Descriptive Statistics for Maternal Rate of Use of Content Level Variables (per second) at the15 Month Time Point (N=82)

Measures at 15 Month Time Point	**Mean**	**SD**	**Range**
Content Level Variables			
Immediate Strategies			
Rate of Labeling	0.112	0.055	0.013 - 0.262
Rate of Seeking Participation	0.063	0.039	0 - 0.152
Rate of Answering Own Question	0.004	0.007	0 - 0.027
Rate of Using Prohibitions	0.016	0.019	0 - 0.083
Rate of Encouraging Attention and Continuing the Interaction	0.185	0.071	0.027 - 0.324
Elaborated Strategies			
Rate of Adding Information Beyond the Book	0.023	0.029	0 - 0.152
Rate of Relating the Book to Child's Life	0.016	0.020	0 - 0.100
Rate of Attributing Meaning to Child Action or Behavior	0.010	0.013	0 - 0.066

Rate of Using Book or Print Conventions	0.036	0.026	0 - 0.146
Rate of Use of Immediate Strategies [a]	0.385	0.119	0.028 - 0.672
Rate of Use of Elaborated Strategies	0.050	0.038	0 - 0.198

[a] Rate of use of Immediate Strategies does not include values from Answering Own Question due to the limited occurrence of this individual code as described in the body of this chapter.

At both time points, mothers had a higher rate of use of Immediate Strategies than their rate of use of Elaborated Strategies. For example, at the 6 month time point, mothers used approximately 19 Immediate Strategies per minute (0.313 per second), whereas they only used 5 Elaborated Strategies per minute (0.081 per second). Likewise, at the 15 month time point, they produced 23 Immediate Strategies per minute (0.385 per second), yet only used 3 Elaborated Strategies per minute (0.050 per second). Variables representing the rate of Immediate Strategies and the rate of Elaborated Strategies approximated the normal distribution. Composite rate variables were utilized in regression procedures examining predictive relationships.

Child Variables

Children's communication outcomes were measured at the 15 month time point. Mothers provided information regarding their children's communication abilities for the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002), and standard scores were obtained, representing the Total Standard Score, Social Composite Standard Score, Speech Composite Standard Score, and Symbolic Composite Standard Score. Additionally, several variables were generated at the 15 month time point from the SALT (Miller & Chapman, 2004) transcripts of book sharing interactions. These book sharing child variables included

the following outcomes: (a) the total number of child communication attempts, (b) the number of different words produced, and (c) the total number of gestures. Means, standard deviations, and ranges of the child outcome variables are reported in Table 4.5.

Table 4.5

Descriptive Statistics for Child Communication at the 15 Month Time Point (*N*=82)

Child Measures at 15 Month Time Point	**Mean**	**SD**	**Range**
CSBS DP Infant-Toddler Checklist			
Total Standard Score	100.15	16.07	68 - 135
Social Composite Standard Score	10.87	3.76	4 – 17
Speech Composite Standard Score	10.02	3.06	3 – 17
Symbolic Composite Standard Score	9.59	2.89	3 – 17
Child Communication Attempts	11.44	13.37	0 - 57
Child Number of Different Words	0.82	1.94	0 – 21
Total Number of Gestures	3.87	5.75	0 – 30

In terms of the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002), children in the current study had standard scores with means and standard deviations similar to the reported means and standard deviations of the normative sample. There were, however, differences in the distributions of the three Composite Standard Scores in comparison to the relative distribution of each Composite Standard Score reported in the *CSBS DP Infant-Toddler Checklist* Manual. Specifically, a greater proportion of children in the current sample displayed lower Composite Standard Scores than those in the normative

sample, and a few children obtained the highest possible standard score. Additionally, closer examination of the histograms suggested some differences between the Composite Standard Scores of the current sample. These histograms (provided in Appendix B) suggest that there may be concerns regarding the normality of the Social Composite Standard Score and the Speech Composite Standard Score. In contrast, the Symbolic Composite Standard Score generally approximated a normal distribution. Although the Total Standard Score displayed a generally normal distribution, with means and standard deviations similar to the normative sample, it represents a combination of the different aspects of communication measured on the *CSBS DP Infant-Toddler Checklist*, and thus may not reflect more subtle differences among children. For this reason, the Total Standard Score was not used for analysis in this study.

It should also be noted that the standardization sample of the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002) included mothers with higher levels of education, such that 52.1% of the mothers had a college degree. By comparison, mothers with college degrees or more advanced education represented only 7% of the current sample. In contrast to these proportions, according to national data sources (U.S. Census Bureau, October 2006) 16% of Caucasian females living outside metropolitan areas have college degrees or more advanced education. Table 4.6 reports the percentage of children in the current study relative to mothers' education level, in comparison with data from the *CSBS DP Infant-Toddler Checklist* standardization sample, and recent data from the U.S. Census Bureau Current Population Survey (U.S. Census Bureau, October 2006). Therefore, with such differences in education levels between the standardization sample and the current sample, the data may need to be interpreted with caution.

Table 4.6

Comparisons of Maternal Education Level between Different Samples

Maternal Education Completed	**Current Sample (%)[a]**	***CSBS DP Infant-Toddler Checklist (%)[b]***	**U.S. Census Bureau (%)[c]**
Some high school or less	20	3.8	17
High school degree	40	21.4	38
Education beyond high school or Associate's Degree	33	22.8	28
College degree or additional Advanced degree	7	52.1	16

[a] Represents the percentage of mothers in the current sample based on an average of the data from the 6 and 15 month time points.

[b] Represents the percentage of mothers in the standardization sample, obtained from the *CSBS DP* Manual (Wetherby & Prizant, 2002).

[c] Represents the percentage of White females over the age of 18 years, living outside of a metropolitan area, obtained from U.S. Census Bureau, Current Population Survey, 2005 Annual Social and Economic Supplement.

The child SALT (Miller & Chapman, 2004) variables were also examined for normality of distribution. When looking at the variable representing the total number of child communication attempts, the analysis of normality revealed a positive skew (tail extending to the right) with 47 (approximately 57%) of the children using fewer than 10 communication attempts (which could be verbal or nonverbal) in the book sharing interaction. Additionally, the variable representing the number of different words was highly

skewed, as 60 children (approximately 73%) did not produce any words within the interaction. Further, the variable representing the total number of gestures was examined for normality. The total number of gestures was computed from the sum of all individual gestures produced by the child. These gestures were identified by the transcribers and were entered in the original SALT transcripts. At the 15 month time point the following individual gestures were identified: (a) pointing, (b) reaching, (c) shaking head, (d) shrugging, (e) nodding, (f) giving, (g) gesturing to a body part, or (h) use of another conventional gesture (e.g., waving bye-bye). In the current study, 32 children (approximately 39%) did not produce any gestures within the book sharing interaction. Given these noteworthy departures from the normal distribution and the limited range of variability, the child SALT variables were not utilized as outcome variables in the analyses related to the research questions of the current study.

Control Variables

The means, standard deviations and ranges for the variables representing maternal education level and the family's income-to-needs ratio are reported in Tables 4.1 and 4.2, respectively. Maternal education levels in this sample ranged from mothers having some high school education but no degree, to mothers having a professional degree or Ph.D. The mean value of maternal education level at both the time points indicated that on average mothers had obtained a high school degree or GED. However, calculation of the mean value is influenced by the numerical values assigned to attaining higher education (e.g. the value of 3 is given to those with a high school education and the value of 6 is assigned when mothers have obtained a 4-year college degree) and the mean may not reflect the actual levels of educational achievement in the sample. Closer examination of the maternal education

variable indicated that 62% of the participants at the 6 month time point either had less than a high school degree or only a high school degree/GED. Similar patterns were evident at the 15 month time point, with 59% of the participants in these lower education levels. These values were comparable to a national sample of Caucasian females living in more rural areas, in which approximately 55% had either less than a high school degree or only a high school degree/GED (U.S. Census Bureau, October 2006). Income-to-needs ratios were all less than 2.0 as selected by the design of the study, with means and ranges at the 6 month time point similar to those at the 15 month time point. Maternal education level and income-to-needs ratio were utilized as control variables in research questions examining predictive relationships through hierarchical linear regressions.

Summary of Descriptive Analyses

The examination of descriptive statistics helped identify the specific variables that could and could not be employed in the planned analyses addressing the research questions for the current study. They also revealed the need to utilize rate versions of maternal language content variables rather than frequency, as there was striking variation in the duration of book sharing interactions across families. Additionally, it highlighted some differences in children's use of communication (including communication attempts, word use, and gesture production) during book sharing.

Analyses of Research Questions

In order to address each research question, several statistical procedures were necessary. The results of the current investigation are described in the following sections, with reference to each research question.

Research Question 1: Differences in Maternal Language Use between the 6 and 15 Month Time Points

The purpose of the first research question was to analyze whether there were changes in maternal language use between the 6 and 15 month time points. In particular, if there were differences, it was of interest to determine what differences existed within the sets of structural and content level variables. Each set of variables was examined prior to analyses to determine if they met the criteria or assumptions necessary for adequate interpretation of a repeated measures multivariate analysis of variance (MANOVA) procedure. Due to the design of this study, there were relatively few criteria to analyze. The data utilized in these repeated measures MANOVA procedures did not have unequal or missing data, and since there were more participants at each time point than the number of dependent variables, deviations from normality of sampling distributions were unlikely (Tabachnick & Fidell, 2001). According to guidelines from Tabachnick and Fidell (2001), a sample size of at least 20 in each group, when sample sizes are equal between groups and two tailed tests are employed, should provide robust tests. Thus, with the 82 participants at each time point, the sample size for this study should ensure robustness of the test. Correlations between all dependent variables were also examined for multicollinearity. Multicollinearity occurs when variables are highly correlated (.90 and above), suggesting that they are similar measures. Multicollinearity of variables indicates that they share much of the same variance and may be redundant. Tabachnick and Fidell (2001) suggest that bivariate correlations above .7 may be cause for concern. Within the set of structural level variables, high correlations ($r > .9$) were noted between the variables representing the total number of words (NTW) and the number of different words (NDW) within each time point. Such high levels of correlation indicate

that these variables share a significant amount of variance, and suggest that they may be redundant in these analyses. As a result, only one of the two variables was included in subsequent analyses. For this particular sample, NDW was chosen as it provides not only a measure of the amount of talk, but also measures vocabulary diversity. In contrast, when examining correlations among the rate of use of content level variables, all correlations within the sets of both the Immediate and Elaborated Strategies were below .6 (only one bivariate correlation was above .5), suggesting that multicollinearity would not be a significant concern.

Structural level differences at 6 and 15 month time points. The variables representing NDW and MLUm at the 6 month and 15 month time points were analyzed in a repeated measures MANOVA procedure. Based on the Wilks' criterion, $\Lambda = .899$, F (2, 80) = 4.50, with $p < .05$, the results suggest that the set of variables had means that were significantly different at the two time points. To identify the specific variables that contributed to the difference between the time points, a univariate F-statistic was also examined for each variable. The variable representing NDW was the only one which was significantly different between the two time points, with F (1, 81) = 4.47, $p < .05$. The results indicated that the number of different words utilized by the primary caregivers at the 15 month time point was greater than the number of different words utilized by the same primary caregivers at the 6 month time point by an average of approximately 7.89 words. The magnitude of the difference can also be reported as an effect size, using a method from Cohen (1992) that divides the difference between the means by the standard deviation. For the NDW variable, d was calculated to be .233, which was classified as a small effect,

according to Cohen's classification of d = .2, .5, .8, representing small, medium, and large effect sizes, respectively (Cohen, 1992).

Content level differences at 6 and 15 month time points. To analyze possible differences between time points in the use of the content level variables, two separate repeated measures MANOVAs and a paired sample t-test were conducted. In all these comparisons between time points, the rate of use for each individual code was utilized. Specifically, the first repeated measures MANOVA involved analysis across time of the set of four individual codes that were classified as Immediate Strategies. As reported earlier, the Answering Own Question code was not included in any analyses due to limited occurrence. The second repeated measures MANOVA examined the set of variables classified as Elaborated Strategies, across the two time points. Finally, to examine the rate of use of the Using Book or Print Conventions code and any differences that might have occurred between the two time points, a paired sample t-test was utilized.

For the set of four Immediate Strategies, the repeated measures MANOVA provided the Wilks' criterion, $\Lambda = .501$, $F\ (4, 78) = 19.39$, $p < .0001$, suggesting that there were significant differences in the means across the two time points. The univariate F-statistics were examined as a follow-up procedure to determine which variables were contributing to this difference. Based on a criterion of $p < .05$, there were two variables, Rate of Labeling and Rate of Seeking Participation, which displayed statistically significant mean differences between the two time points. The four variables representing the rate of use of the individual Immediate Strategies, with corresponding F-statistics, t-value, estimate, root mean square, and effect size are reported in Table 4.7. The positive or negative value of the estimate corresponded to changes in the means, such that a positive change indicates that the mean at

15 months was higher than the mean at 6 months, whereas a negative value indicates that the mean at 6 months was higher than the mean at 15 months. Effect sizes were calculated to estimate the magnitude of the difference between the two time points. The Rate of Labeling and the Rate of Seeking Participation, the two variables that displayed significant positive differences in means between the two time points, had medium (.47) and large (.80) effect sizes, respectively. These results indicated that mothers at the 15 month time point produced statistically significant higher rates of these two codes.

Table 4.7

Univariate Follow-up to Repeated Measures MANOVA for Set of Immediate Strategies

Variable	***F* (1, 81)**	***t* Value**	**Estimate**	**Root Mean Square**	**Effect Size (*d*)**
Rate of Labeling	14.84***	3.85	.0229	.0539	.42
Rate of Seeking Participation	52.23****	7.23	.0285	.0357	.80
Rate of Using Prohibitions	.54	.73	.0022	.0270	.08
Rate of Encouraging Attention and Continuing the Interaction	3.79	1.95	.0181	.0842	.21

***$p < .001$. ****$p < .0001$.

For the set of three Elaborated Strategies, the repeated measures MANOVA provided the Wilks' criterion, $\Lambda = .615$, F (3, 79) = 16.46, $p < .0001$, suggesting that there were significant differences in the means across the two time points. The univariate F-statistics were examined as a follow-up procedure to determine which variables were contributing to

this difference. Based on a criterion of $p < .05$, all three variables (Rate of Attributing Meaning, Rate of Adding Information Beyond the Book, and Rate of Relating the Book to the Child's Life) displayed statistically significant differences in means between the two time points. The set of Elaborated Strategies, with the three variables representing the rate of use of the individual strategies, with corresponding F-statistics, t-value, estimate, root mean square, and effect size are reported in Table 4.7. Note that all of the variables within the set of Elaborated Strategies had negative values for the estimates, suggesting that means at the 6 month time point were higher than the means at the 15 month time point. As evident from Table 4.8, the three variables had effect sizes ranging from small (.27) to medium (.48).

Table 4.8

Univariate Follow-up to Repeated Measures MANOVA for Set of Elaborated Strategies

Variable	***F* (1, 81)**	***t* Value**	**Estimate**	**Root Mean Square**	**Effect Size (*d*)**
Rate of Adding Information Beyond the Book	15.70***	-3.96	-.0152	.0346	.44
Rate of Relating the Book to the Child's Life	6.06*	-2.46	-.0065	.0239	.27
Rate of Attributing Meaning	19.17****	-4.38	-.0095	.0197	.48

*$p < .05$. ***$p < .001$. ****$p < .0001$.

Finally, to analyze mothers' rate of use of book or print conventions at the different time points, a paired samples t-test was conducted. The results suggested that there were significant differences in the rate of use of this code between the two time points, with *t* (81)

= 3.40, $p < .05$. The mean value of the difference was approximately 0.011(or 0.66 times per minute), indicating that mothers used a higher rate of utterances that were coded as Using Book or Print Conventions at 15 months than at 6 months. This difference corresponded to a small to medium effect size of .38.

Research Question 2: Predicting Maternal Language Use at the 15 Month Time Point

The main purpose of the second research question was to identify whether maternal language variables from the 6 month time point predicted maternal language use at the 15 month time point. In order to address this question, relevant variables were first selected, examined for outliers and influence, and subsequently hierarchical linear regressions were performed on each outcome variable. Analyses were performed using SAS (version 8.2) and SPSS (version 15.0).

Selection of variables. To begin analyses, outcome variables of interest were identified at the 15 month time point. Specifically, for the 15 month time point, to describe both the structure and content of mothers' language use, four outcomes were selected. These were (a) the number of different words (NDW), (b) the mean length of utterance in morphemes (MLUm), (c) the rate of use of Immediate Strategies, and (d) the rate of use of Elaborated Strategies. In part, the rates of use of Immediate and Elaborated Strategies were chosen as outcomes to correspond to similar predictor measures. For this research question, the predictor variables of interest at the 6 month time point were the same measures of mothers' language use that had been selected as outcome measures at the 15 month time point. To determine which composite variables to use in the analyses, correlations among predictors were examined to exclude variables displaying multicollinearity. At the 6 month time point, correlations above .7 were noted between NDW and the sum of the Immediate

Strategies, as well as the sum of the Elaborated Strategies. Bivariate correlations that are above .7 may create difficulties with multicollinearity (Tabachnick & Fidell, 2001), resulting in inappropriate analyses. The correlations, however, were below .7 when examining relationships between NDW and the *rate* of use of Immediate Strategies as well as between NDW and the *rate* of use of Elaborated Strategies. Consequently, to represent the content variables, the composite *rate* variables were selected for the predictors at the 6 month time point, and as the outcomes at the15 month time point. In particular, the following variables from the 6 month time point were identified as the predictors of interest: (a) NDW, (b) MLUm, (c) the rate of use of Immediate Strategies, and (d) the rate of use of Elaborated Strategies. Additionally, maternal education level and the income-to-needs ratio (both from the 6 month time point) were utilized as control variables in the analyses. All correlations among predictors and controls were below .7, suggesting that there would not be problems associated with multicollinearity.

Examination of variables. As part of the preliminary analyses, several steps were taken to examine the variables of interest for potential outliers and cases of influence. For all outcome, control, and predictor variables, the process involved examination of the following: (a) standardized scores of each variable, (b) bivariate scatterplots of the outcome (*y*-axis) and each predictor or control (*x*-axis), and (c) values of Cook's D and Mahalanobis distance through an initial regression analysis involving all cases as well as all of the control and predictor variables. This process revealed two or fewer cases with more extreme standardized values in several of the variables, but these values were observed on different cases across the variables. When the bivariate scatterplots were reviewed by observation, several additional cases were identified as potential outliers, but these cases were not

necessarily identified as outliers based on statistical procedures to identify standardized values. Moreover, examination of potentially influential cases as documented in Cook's D values or Mahalanobis distances through the initial regression analyses did not confirm the presence of true outliers or influential cases. In addition, attempts were made to compare the cases that could have been outliers across the various models, and these efforts did not clarify the situation. Thus, a conservative approach was taken and no cases were deleted from the hierarchical regression analyses.

Hierarchical linear regressions. To examine potential predictive relationships for the outcome variables, four separate hierarchical linear regression analyses, corresponding to the four outcomes of interest, were utilized. In each hierarchical linear regression, the control variables measured at the 6 month time point (maternal education level and the income-to-needs ratio) were entered as a block, followed by another block that included all the predictor variables representing mothers' language use.

Mothers' NDW at the 15 month time point was the outcome of interest in the first hierarchical linear regression. The results of the analysis indicated that the final regression model including the two control variables, and all four predictor variables was significant, with the adjusted $R^2 = .277$, $F\ (6, 75) = 6.18$, $p < .0001$. Thus, the final model explained approximately 27.7% of the variance associated with the outcome variable of mothers' use of NDW. Table 4.9 displays the results of each step of the hierarchical linear regression, with corresponding B and standardized beta values for control and predictor variables. Each step was statistically significant. The first block (control variables) resulted in an adjusted $R^2 = .160$, F *change* $(2, 79) = 8.74$, $p < .001$, indicating that the control variables explained 16% of the variance in the outcome. Entering the second block (predictor variables) produced a

change in adjusted R^2 = .117, *F change* (4, 75) = 4.19, $p < .01$, and indicated that as a block, the maternal language variables explained 11.7% of the variance in mothers' NDW at the 15 month time point. By examination of the individual parameter estimates (or B values) and the associated *t*-statistic, in the final model of the regression the control variables representing maternal education level (t (75) = 2.11, $p < .05$) and income-to-needs ratio (t (75) = 2.16, $p < .05$) were the only significant predictors of mothers' NDW at the 15 month time point in the presence of the other maternal language variables.

Table 4.9

Hierarchical Regression Predicting Maternal NDW at the 15 Month Time Point (N = 82)

Variables at 6 Month Time Point	***B***	**SE *B***	**β**
Step 1			
Constant	32.752	10.899	
Maternal Education	6.647	2.656	.260*
Income-to-Needs Ratio	18.217	6.521	.290**
Step 2			
Constant	9.322	23.534	
Maternal Education	5.304	2.516	.207*
Income-to-Needs Ratio	13.671	6.341	.218*
NDW	0.303	0.172	.238
MLUm	-2.034	7.493	-.030
Rate of Use of Immediate Strategies	55.067	32.530	.212
Rate of Use of Elaborated Strategies	15.810	99.677	.021

Note. adjusted R^2 = .160 for Step 1; Δ adjusted R^2 = .117 for Step 2 (*p*s < .01).

full model adjusted $R^2 = .277$, F (6, 75) = 6.18, $p < .0001$.

*$p < .05$. **$p < .01$

Next, mothers' MLUm at the 15 month time point was the outcome of interest in the second hierarchical linear regression. The results of the analysis indicated that the final regression model that included all control and predictor variables was not significant, F (6, 75) = 1.30, $p = .269$. There were no significant steps of the hierarchical regression and as the final model was not significant, individual parameter estimates were not examined. These results are provided in Table 4.10.

Table 4.10

Hierarchical Regression Predicting Maternal MLUm at the 15 Month Time Point (N = 82)

Variables at 6 Month Time Point	***B***	**SE *B***	**β**
Step 1			
Constant	2.724	.214	
Maternal Education	.049	.052	.108
Income-to-Needs Ratio	-.007	.128	-.007
Step 2			
Constant	1.827	.490	
Maternal Education	.031	.052	.069
Income-to-Needs Ratio	-.043	.132	-.038
NDW	.002	.004	.079
MLUm	.251	.156	.206

Rate of Use of Immediate Strategies	.217	.677	.047
Rate of Use of Elaborated Strategies	.869	2.074	.064

Maternal rate of use of Immediate Strategies at the 15 month time point was the outcome of interest for the third hierarchical linear regression. The results of the analysis indicated that the final regression model that included the two control variables and all four predictor variables was significant, with the adjusted $R^2 = .343$, $F\ (6, 75) = 8.04$, $p < .0001$. Approximately 34.3% of the variance associated with the outcome variable of the mothers' rate of use of Immediate Strategies (at the 15 month time point) was explained by this final model. Table 4.11 displays the results of each step of the hierarchical linear regression, with corresponding B and standardized beta values for control and predictor variables. The first step of the hierarchical regression was significant and produced an adjusted R^2 of .051, *F change* (2, 79) = 3.20, $p < .05$, and indicated that the control variables alone were able to explain approximately 5.1% of the variance in the outcome. The change in adjusted R^2 (Δ adjusted $R^2 = .292$) for the addition of the block of variables representing mothers' language use was also significant, *F change* (4, 75) = 9.76, $p < .0001$, such that the maternal language variables from the 6 month time point explained approximately 29.2% of the variance in mothers' rate of use of Immediate Strategies at the 15 month time point. By examination of the individual parameter estimates (or B values) and the associated *t*-statistic, the variable representing the rate of use of Immediate Strategies at the 6 month time point was the only significant contributor to the model with other variables in the model, $t\ (75) = 5.40$, $p < .0001$. Based on the results presented, mothers' rate of use of Immediate Strategies at 6 months, within the block of maternal language variables, was a significant predictor of

mothers' rate of use of Immediate Strategies at 15 months, beyond the contributions of maternal education level and income-to-needs ratio.

Table 4.11

Hierarchical Regression Predicting Maternal Rate of Use of Immediate Strategies at the 15 Month Time Point (N = 82)

Variables at 6 Month Time Point	***B***	**SE *B***	**β**
Step 1			
Constant	.292	.041	
Maternal Education	.013	.010	.142
Income-to-Needs Ratio	.046	.024	.208
Step 2			
Constant	.064	.079	
Maternal Education	.011	.008	.127
Income-to-Needs Ratio	.009	.021	.039
NDW	.000	.001	-.036
MLUm	.041	.025	-.171
Rate of Use of Immediate Strategies	.586	.109	.646***
Rate of Use of Elaborated Strategies	-.246	.333	.-.092

Note. adjusted $R^2 = .051$ for Step 1; $\Delta R^2 = .292$ for Step 2 (ps < .05)

full model adjusted $R^2 = .343$, $F(6, 75) = 8.042$, $p < .0001$

***$p < .001$

Mothers' rate of use of Elaborated Strategies at the 15 month time point was the outcome of interest in the fourth and final hierarchical linear regression addressing this specific research question. The results of the analysis indicated that the final regression model that included the two control variables and all four predictor variables was significant, with the adjusted $R^2 = .199$, $F\ (6, 75) = 4.35$, $p < .001$. The final model explained approximately 19.9% of the variance associated with the outcome variable of mothers' rate of use of Elaborated Strategies at 15 months. Table 4.12 displays the results of each step of the hierarchical linear regression, with corresponding B and standardized beta values for control and predictor variables. The first step of the hierarchical regression was not significant, however, the change in adjusted R^2 (Δ adjusted $R^2 = .223$) for the addition of the block of variables representing mothers' language use was significant, *F change* $(4, 75) = 6.48$, $p < .001$. Addition of the maternal language variables explained 22.3% more of the variance than a model with just the control variables. By examination of the individual parameter estimates (or B values) and the associated *t*-statistic, the variable representing the rate of use of Elaborated Strategies at the 6 month time point was the only significant contributor to the model, when all other variables were present in the model, $t\ (75) = 3.08$, $p < .01$. Based on the results presented, mothers' rate of use of Elaborated Strategies at the 6 month time point was the only variable within the block of maternal language variables that was a significant predictor of mothers' rate of use of Elaborated Strategies at 15 months.

Table 4.12

Hierarchical Regression Predicting Maternal Rate of Use of Elaborated Strategies at the 15 Month Time Point (N = 82)

Variables at 6 Month Time Point	***B***	**SE *B***	**β**
Step 1			
Constant	.045	.013	
Maternal Education	.001	.003	.027
Income-to-Needs Ratio	.002	.008	.025
Step 2			
Constant	.021	.028	
Maternal Education	-.001	.003	-.053
Income-to-Needs Ratio	-.004	.007	-.058
NDW	< .001	.000	.040
MLUm	-.002	.009	-.030
Rate of Use of Immediate Strategies	.038	.038	.133
Rate of Use of Elaborated Strategies	.360	.117	.423**

Note. adjusted R^2 = -.024 for Step 1 (*ns*); Δ adjusted R^2 = .223 for Step 2 ($p < .001$); full model adjusted R^2 = .199, $F(6, 75) = 4.348$, $p < .001$

**$p < .01$

Research Question 3: Predicting Children's Communication from Maternal Language Use at the 6 Month Time Point

The focus of the third research question was to identify potential predictive relationships between mothers' use of language at the 6 month time point and children's communication outcomes at the15 month time point, beyond the contributions of mothers' education level and income-to-needs ratios (measured at the 6 month time point). In order to address this question, specific variables were selected for the analyses. Next, these variables of interest were examined for potential outliers and influential cases, and then hierarchical linear regression procedures were utilized. Analyses were performed using SAS (version 8.2) and SPSS (version 15.0).

Selection of variables. For the third research question the predictor variables of interest from the 6 month time point were: (a) NDW, (b) MLUm, (c) the rate of use of Immediate Strategies, and (d) the rate of use of Elaborated Strategies. Composites rate variables of Immediate and Elaborated Strategies were selected to represent the content level variables because the sum of the Immediate Strategies and sum of Elaborated Strategies had correlations with NDW above .7, suggesting issues of multicollinearity. For the initial screening process, correlations between the predictor variables of interest were examined. Bivariate correlations were all below .7, and suggested that multicollinearity would not be a concern.

In addition to identifying the predictor variables, the outcome variables of interest were also selected. Children's communication at the 15 month time point was assessed with the *CSBS DP Infant-Toddler Checklist* and also was documented in analyses of the SALT transcripts generated from the book sharing interactions. Specifically, the *CSBS DP Infant-*

Toddler Checklist provided standard scores representing a Total Standard Score, a Social Composite Standard Score, a Speech Composite Standard Score, and a Symbolic Composite Standard Score for each child. In the current study the Composite Standard Scores of the *CSBS DP Infant-Toddler Checklist* were of interest, as they represented different aspects of communication (Social, Speech, and Symbolic). The descriptive statistics reviewed earlier indicated that the Symbolic Composite Standard Score was generally normally distributed, although there may have been some issues regarding normality for the Social and Speech Composite Standard Scores. For the current study, the child variables of interest from the SALT analyses were: (a) the total number of child communication attempts, (b) the number of different words produced, and (c) the total number of gestures. However, the book sharing child variables did not have normal distributions. As indicated earlier, the distributions were positively skewed and some variables displayed a high proportion of zero values. For these reasons, the child variables from the analyses of the SALT transcripts were not analyzed as outcome variables. Consequently, only the *CSBS DP Infant-Toddler Checklist* outcomes were utilized in the hierarchical regression analyses. Thus, three separate hierarchical regression analyses were conducted, each with a different Composite Standard Score as the outcome variable of interest.

Examination of variables. In a similar procedure to that described in the earlier research question, the variables of interest were inspected for potential outliers and influential cases. For all outcome, control, and predictor variables the following items were examined: (a) standardized scores of each variable, (b) bivariate scatterplots of the outcome (*y*-axis) and each predictor or control (*x*-axis), and (c) values of Cook's D and Mahalanobis distance through an initial regression analysis involving all cases as well as all of the control

and predictor variables. This process revealed that there may have been two or fewer cases with extreme standardized values in a couple of the variables, but these values were observed on different cases across the variables. Inspection of bivariate scatterplots presented several additional cases that may have been outliers, but these cases were not necessarily identified as outliers based on statistical analyses to compute standardized values. Moreover, examination of potentially influential cases as documented in Cook's D values and Mahalanobis distances through initial regression analyses did not confirm the presence of true outliers or influential cases. In addition, attempts were made to compare the cases that could have been outliers across the various models for this research question, and these efforts did not clarify the situation. Therefore, a conservative approach was taken and no cases were deleted from the hierarchical regression analyses.

Hierarchical linear regressions. The first hierarchical regression analysis for this question involved the *CSBS DP Infant-Toddler Checklist* Social Composite Standard Score as the outcome, with the two control variables entered as the first block, and the four predictor variables that documented mothers' language use entered in three additional blocks representing the set of structural variables, the rate of use of Immediate Strategies and the rate of use of Elaborated Strategies, respectively. The sequence of entry of the blocks was determined by interest in the influence of the content level variables. That is, it was of interest to examine the contribution of the content level variables (represented by the rate of use of Immediate Strategies and the rate of use of Elaborated Strategies) beyond the contribution of the structural level variables (NDW and MLUm) and the control variables (maternal education level and income-to-needs ratio). Table 4.13 presents the results of this

hierarchical regression. The analyses indicated that there were no significant steps in the hierarchical sequence and that the final model was not significant (F (6, 75) = .94, p = .47).

Table 4.13

Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Social Composite Standard Scores from Maternal Variables at the 6 Month Time Point (N = 82)

Variables at the 6 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	9.683	1.319	
Maternal Education	.121	.321	.043
Income-to-Needs Ratio	.714	.789	.103
Step 2			
Constant	4.963	2.683	
Maternal Education	.048	.322	.017
Income-to-Needs Ratio	.635	.779	.092
NDW	.011	.017	.078
MLUm	1.471	.884	.195
Step 3			
Constant	4.626	2.963	
Maternal Education	.052	.324	.019
Income-to-Needs Ratio	.568	.820	.082
NDW	.008	.020	.056
MLUm	1.558	.944	.207

Rate of Use of Immediate Strategies	1.105	4.010	.039
Step 4			
Constant	4.416	3.061	
Maternal Education	.061	.327	.022
Income-to-Needs Ratio	.568	.825	.082
NDW	.011	.022	.075
MLUm	1.624	.974	.216
Rate of Use of Immediate Strategies	1.491	4.231	.052
Rate of Use of Elaborated Strategies	-3.924	12.963	-.047

Similarly, a second hierarchical regression analysis, was conducted with all the same controls and predictors, but utilizing the *CSBS DP Infant-Toddler Checklist* Speech Composite Standard Score as the outcome. The variables were entered in the sequence described for the first hierarchical regression in this series. As evident from Table 4.14, the results of the second hierarchical regression indicated that there were no significant steps in the hierarchical sequence and that the final model was not significant (F (6, 75) = .65, p = .69).

Table 4.14

Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Speech Composite Standard Scores from Maternal Variables at the 6 Month Time Point (N = 82)

Variables at the 6 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	10.545	1.080	
Maternal Education	-.124	.263	-.054
Income-to-Needs Ratio	-.090	.646	-.016
Step 2			
Constant	11.367	2.253	
Maternal Education	-0.102	.270	-.044
Income-to-Needs Ratio	-.070	.654	-.012
NDW	-.005	.014	-.042
MLUm	-.203	.743	-.033
Step 3			
Constant	9.580	2.440	
Maternal Education	-.077	.267	-.033
Income-to-Needs Ratio	-.422	.675	-.075
NDW	-.021	.017	-.188
MLUm	-.260	.778	.042
Rate of Use of Immediate Strategies	5.867	3.302	.252
Step 4			

Constant	9.846	2.518	
Maternal Education	-.088	.269	-.038
Income-to-Needs Ratio	-.421	.678	-.075
NDW	-.025	.018	-.218
MLUm	.177	.802	.029
Rate of Use of Immediate Strategies	5.378	3.481	.231
Rate of Use of Elaborated Strategies	4.976	10.665	.073

In the same manner, a third hierarchical regression analysis was conducted with all the same controls and predictors, but utilizing the *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score as the outcome. The results of the third hierarchical regression indicated that there were no significant steps in the hierarchical sequence and that the final model was not significant (F (6, 75) = .79, p = .58). These findings are presented in Table 4.15.

Table 4.15

Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Symbolic Composite Standard Scores from Maternal Variables at the 6 Month Time Point (N = 82)

Variables at the 6 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	7.814	.996	
Maternal Education	.434	.243	.200
Income-to-Needs Ratio	.267	.596	.050

Step 2			
Constant	6.684	2.074	
Maternal Education	.402	.249	.186
Income-to-Needs Ratio	.238	.602	.045
NDW	.007	.013	.064
MLUm	.273	.683	.047
Step 3			
Constant	6.878	2.291	
Maternal Education	.400	.250	.185
Income-to-Needs Ratio	.276	.634	.052
NDW	.009	.016	.081
MLUm	.223	.730	.039
Rate of Use of Immediate Strategies	-.639	3.101	-.029
Step 4			
Constant	6.569	2.362	
Maternal Education	.413	.253	.190
Income-to-Needs Ratio	.276	.637	.052
NDW	.013	.017	.118
MLUm	.320	.752	.055
Rate of Use of Immediate Strategies	-.071	3.266	-.003
Rate of Use of Elaborated Strategies	-5.778	10.006	-.089

Based on the results of these hierarchical regression analyses, the rate of use of Immediate Strategies and the rate of use of Elaborated strategies (both measured at the 6 month time point) did not explain a significant amount of variance in any of the child outcomes examined at 15 months. Additionally, inclusion of the variables from the 6 month time point representing maternal education level, income-to-needs ratio, NDW, and MLUm did not predict these child communication outcomes.

Research Question 4: Predicting Children's Communication from Maternal Language Use at the 15 Month Time Point

The final research question examined the predictive relationship between mothers' language use at the 15 month time point and children's communication outcomes at the same time point. As described in the earlier research questions, variables were identified for the analyses and then examined for possible outliers and cases of influence. Hierarchical regression procedures were utilized to identify potential contributions of the predictor variables beyond the contributions of the control variables of maternal education level and income-to-needs ratio. Analyses were performed using SAS (version 8.2) and SPSS (version 15.0).

Selection of variables. Specifically, the predictors representing mothers' language use at the 15 month time point were: (a) NDW, (b) MLUm, (c) the rate of use of Immediate Strategies, and (d) the rate of use of Elaborated Strategies. Bivariate correlations among these predictors were examined, with the highest correlation determined to be less than .6. Since correlations were below .7, multicollinearity was not suspected. The child outcome variables utilized were the *CSBS DP Infant-Toddler Checklist* Composite Standard Scores, as they represented several aspects of children's communication. Each Composite Standard

Score (Social, Speech, and Symbolic) was analyzed in three separate hierarchical regression analyses.

Examination of variables. In a similar procedure to that described in the earlier research questions, the variables of interest were inspected for potential outliers and influential cases. For the outcome, control, and predictor variables the following items were examined: (a) standardized scores of each variable, (b) bivariate scatterplots of the outcome (*y*-axis) and each predictor or control (*x*-axis), and (c) values of Cook's D and Mahalanobis distance through an initial regression analysis involving all cases as well as all of the control and predictor variables. This process revealed that among the control, predictor, and outcome variables at the 15 month time point there may have been two or fewer cases with extreme standardized values, but as in earlier questions, these values were observed on different cases across the variables. Inspection of bivariate scatterplots presented additional cases that may have been outliers, but again these cases were not necessarily identified as outliers based on statistical analyses to calculate standardized values. Moreover, examination of potentially influential cases as documented in Cook's D values and Mahalanobis distances through initial regression analyses did not confirm the presence of true outliers or influential cases. Comparisons were made across various models to identify common outliers, and these efforts did not clarify the situation. Therefore, a conservative approach was taken and no cases were deleted from the subsequent hierarchical regression analyses.

Hierarchical linear regressions. In the first hierarchical regression, the *CSBS DP Infant-Toddler Checklist* Social Composite Standard Score was selected as the outcome. The control variables from the 15 month time point of maternal education level and income-to-

needs ratio were entered as the first block. Next, the 15 month structural level variables (NDW and MLUm) were entered as a set, followed by the rate of use of Immediate Strategies, and then the rate of use of Elaborated Strategies. This sequence of entry, with 4 blocks, allowed examination of the contribution of the structural level variables beyond the contribution of the control variables, and also identification of additional contributions from the rate of use of Immediate Strategies and the rate of use of Elaborated Strategies. The analyses indicated that there were no significant steps in the sequence and the final model was not significant (F (6, 75) = .53, p = .78). These hierarchical regression analyses are reported in Table 4.16.

Table 4.16

Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Social Composite Standard Scores from Maternal Variables at the 15 Month Time Point (N = 82)

Variables at the 15 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	9.434	1.432	
Maternal Education	.078	.321	.027
Income-to-Needs Ratio	1.059	.803	.147
Step 2			
Constant	10.197	2.459	
Maternal Education	.063	.340	.022
Income-to-Needs Ratio	1.060	.817	.147
NDW	.004	.016	.035

MLUm	-.347	.865	-.056
Step 3			
Constant	8.540	2.876	
Maternal Education	.026	.341	.009
Income-to-Needs Ratio	.844	.839	.117
NDW	-.001	.017	-.005
MLUm	-.099	.893	-.016
Rate of Use of Immediate Strategies	4.259	3.851	.135
Step 4			
Constant	8.505	2.904	
Maternal Education	.020	.345	.007
Income-to-Needs Ratio	.829	.850	.115
NDW	<.0001	.017	-.001
MLUm	-.068	.919	-.011
Rate of Use of Immediate Strategies	4.375	3.944	.139
Rate of Use of Elaborated Strategies	-1.985	12.473	-.020

The second hierarchical regression utilized the *CSBS DP Infant-Toddler Checklist* Speech Composite Standard Score as the outcome in the model. Control and predictors were entered as described for the model with the *CSBS DP Infant-Toddler Checklist* Social Composite Standard Score outcome. Similar results were obtained, as presented in Table 4.17, with no significant steps identified as in the hierarchical process and the final model was not significant (F (6, 75) = .23, p = .96).

The third hierarchical regression had the *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score as the outcome in the model. The order of entry of each block was identical to the two previous hierarchical regression procedures. In this sequence, the first model, with only the control variables entered, was significant with the adjusted R^2 = .054, F (2, 79) = 3.32, $p < .05$. When the individual parameter values were examined, there were no significant individual contributors to this model. Therefore, approximately 5.4% of the variance associated with the *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score is explained by the contribution of these control variables together. There were no other significant models evident in the subsequent steps of the hierarchical process and the final model with two control variables and all four predictors was not statistically significant (F (6, 75) = 2.11, p = .061). Results of these analyses are reported in Table 4.18. These findings indicated that when entered in this particular sequence, neither the structural level variables (NDW and MLUm), nor the content level variables (the rate of use of Immediate Strategies and the rate of use of Elaborated Strategies) were significant predictors of the *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Scores, after taking into account the contributions of the control variables.

Table 4.17

Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Speech Composite Standard Scores from Maternal Variables at the 15 Month Time Point (N = 82)

Variables at the 15 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	9.570	1.174	

Maternal Education	-.031	.263	-.013
Income-to-Needs Ratio	.514	.658	.088
Step 2			
Constant	10.296	2.016	
Maternal Education	-.049	.279	-.021
Income-to-Needs Ratio	.512	.670	.087
NDW	.004	.013	.048
MLUm	-.340	.709	-.068
Step 3			
Constant	9.360	2.368	
Maternal Education	-.070	.281	-.030
Income-to-Needs Ratio	.390	.691	.067
NDW	.002	.014	.020
MLUm	-.199	.735	-.040
Rate of Use of Immediate Strategies	2.406	3.170	.094
Step 4			
Constant	9.386	2.390	
Maternal Education	-.066	.284	-.028
Income-to-Needs Ratio	.401	.700	.069
NDW	.001	.014	.016
MLUm	-.222	.757	-.044
Rate of Use of Immediate Strategies	2.321	3.247	.090
Rate of Use of Elaborated Strategies	1.447	10.268	.018

Table 4.18

Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Symbolic Composite Standard Scores from Maternal Variables at the 15 Month Time Point (N = 82)

Variables at the 15 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	6.994	1.068	
Maternal Education	.399	.239	.180
Income-to-Needs Ratio	1.094	.599	.198
Step 2			
Constant	6.243	1.807	
Maternal Education	.293	.250	.133
Income-to-Needs Ratio	.988	.600	.179
NDW	.015	.012	.173
MLUm	.048	.635	.010
Step 3			
Constant	5.090	2.115	
Maternal Education	.267	.251	.121
Income-to-Needs Ratio	.837	.617	.152
NDW	.012	.012	.136
MLUm	.221	.656	.047
Rate of Use of Immediate Strategies	2.965	2.831	.123
Step 4			

Constant	5.330	2.104	
Maternal Education	.304	.250	.138
Income-to-Needs Ratio	.941	.616	.170
NDW	.008	.012	.099
MLUm	.010	.666	.002
Rate of Use of Immediate Strategies	2.178	2.585	.090
Rate of Use of Elaborated Strategies	13.457	9.039	.177

Note. adjusted R^2 =.054 for Step 1 ($p < .05$); all other steps were nonsignificant.

As there were models in the hierarchical sequence for the *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score that approached statistical significance, additional regression analyses were conducted. In particular, a model that included only the two control variables and the rate of Elaborated Strategies was identified as the only 3-variable model that was statistically significant in predicting children's communication. For this analysis, the control variables were entered as the first block and mothers' rate of use of Elaborated Strategies was entered as the only variable in the second block. This final model resulted in an adjusted R^2 of .095, F (3, 78) = 3.85, $p < .05$ and thus explained approximately 9.5% of the variance in children's *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score. Inspection of the individual parameter values indicated that in the presence of the control variables, mothers' rate of use of Elaborated Strategies at the 15 month time point was significant, t (78) = 2.14, $p < .05$. Table 4.19 displays the results of this additional hierarchical regression. Based on the change in adjusted R^2 (Δ adjusted R^2 = .041; *F change* = 4.60, $p < .05$), addition of mothers' rate of use of Elaborated Strategies at the 15 month time point was significant and explained an additional 4.1% of the variance in children's

CSBS DP Infant-Toddler Checklist Symbolic Composite Standard Score, beyond the contributions of the control variables.

Table 4.19

Additional Hierarchical Regression Predicting CSBS DP Infant-Toddler Checklist Symbolic Composite Standard Scores from Selected Maternal Variables at the 15 Month Time Point (N = 82)

Variables at the 15 month time point	***B***	**SE *B***	**β**
Step 1			
Constant	6.994	1.068	
Maternal Education	.399	.239	.180
Income-to-Needs Ratio	1.094	.599	.198
Step 2			
Constant	6.124	1.120	
Maternal Education	.394	.234	.178
Income-to-Needs Ratio	1.122	.586	.203
Rate of Use of Elaborated Strategies	17.255	8.045	.227*

Note. adjusted $R^2 = .054$ for Step 1; Δ adjusted $R^2 = .041$ for Step 2 ($ps < .05$).

full model adjusted $R^2 = .095$, $F(3, 78) = 3.85$, $p < .05$

*$p < .05$

Summary of Statistical Analyses

The current investigation examined potential differences in maternal language use over time and analyzed possible relationships between mothers' use of language and children's communication outcomes. In particular, differences in mothers' structural and content level language use were identified between the 6 and 15 month time points. Moreover, mothers' rates of use of both Immediate and Elaborated Strategies at the 6 month time point were predictive of their rates of use of these strategies at the 15 month time point. Most relationships between maternal language use and children's communication outcomes were not significant when all predictors and controls were considered. In contrast, when utilized as a single predictor, mothers' rate of use of Elaborated Strategies explained a small, but significant amount of the variance in children's *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score, beyond the contributions of maternal education and income-to-needs ratio.

CHAPTER 5: DISCUSSION

The current study examined the characteristics of mothers' language use with their young children during book sharing interactions at the 6 and 15 month time points, and also documented children's communication abilities at the 15 month time point. The multiple purposes of the study included identifying potential differences in maternal language use across the two time points and investigating the possible influence of maternal language use on child communication outcomes. This was the first effort to examine these issues in a population of mothers and young children from low income and rural environments. The chapter will focus on interpreting the findings in reference to the participants' characteristics and in relation to previous research.

Characteristics of the Language of Caregivers

The current investigation examined several aspects of mothers' language use during book sharing interactions with their young children, in families from low income, rural environments. In particular, there was a large degree of variation in maternal amount of talk and maternal vocabulary diversity, with similar findings reported in other research involving Caucasian families with low incomes (e.g. Rowe et al., 2005; Tizard & Hughes, 1984). Further, when examining the maternal language strategies utilized within the current sample, it was evident that there was a range of strategies produced within each time point. Analyses also noted maternal use of some Elaborated Strategies at both time points, which can be considered a more elaborate form of discourse. These results are parallel to those of Tabors, Roach, and Snow (2001), who observed parents' use of extended discourse and rare

words with their preschool-age children, and extend those findings to maternal talk with infants and toddlers. Specifically within the current study, mothers produced a significantly higher rate of Elaborated Strategies at the 6 month time point. It may be that the nature of the book at the 6 month time point was more familiar to the families, and thus influenced their rate of use of Elaborated Strategies, as earlier research from Pellegrini and others (1990) noted that parents from low income environments used more language strategies in text formats that were more familiar to them. The current sample of mothers also produced more Immediate Strategies than Elaborated Strategies within each time point, representing their use of more concrete utterances rather than abstract utterances. These findings support and extend research that identified a greater proportion of concrete forms of maternal utterances during book sharing with preschool-age children in families from low income environments, in comparison to more abstract or non-immediate forms (DeTemple, 2001). The differences in types and rates of maternal language strategies noted within and across time points also suggest that mothers were possibly modifying their language use based on child characteristics as have mothers in other low-income environments (DeTemple, 2001; Heath, 1983; Pellegrini et al., 1990; Rowe et al., 2005). Examination of the current sample indicates that the mothers did not produce a high level of prohibitions in comparison to other maternal language strategies. However, comparisons between this sample and families with higher incomes were not possible as the current investigation included only families with incomes less than 200% of the federal poverty level.

In the current study, both the structure and content of mothers' language use during book sharing interactions were analyzed at the 6 and 15 month time points. These characteristics were examined to address research questions regarding potential differences in

maternal language use over time and to investigate relationships between maternal language use and children's communication outcomes. The planned analyses looked separately at the structure and content of mothers' language use to identify their specific contributions. The results are discussed below with reference to these features of mothers' language.

Analyzing the Structure of Mothers' Language

A careful examination of the results of the various analyses suggests that structural elements of mothers' language use were related to each other. For example, the mothers who produced the greatest number of words also used the greatest variety of words, a finding that was similar to other research (e.g. Hart & Risley, 1995; Hoff, 2003; Weizman & Snow, 2001). Furthermore, there was a great deal of variability across the sample in terms of the number of different words used by the mothers. The large range of values indicates that variability is present within families from low income environments, not just between families of differing income levels. These data support recent research from Rowe and others (2005) who also documented considerable variability in the number of different words used by parents of 14 to 36 month old children, within a sample of families with low incomes. Additionally, the current data suggest that there is variability in maternal language use even with infants, extending downward the research that has described variability in mothers' language use with older children.

Examining the specifics of the variability in total words among the mothers in the current sample reveals dramatic differences between the mothers at the two ends of the range. The number of total words that mothers used at the highest end of the range at the 6 month time point (maximum number of words used was 496) increased by 63% at the 15 month time point (maximum number of words used was 776). In striking contrast, the

mothers at the lowest end of the range in terms of total number of words only had an increase from 9 words at the 6 month time point to 12 words (33% increase) at the 15 month time point. Thus, these data reveal vastly different experiences for the children engaged in these book sharing interactions in terms of maternal language input from the mothers at opposite ends of the range. If such differences in language input are evident as early as 6 months and increase by the 15 month time point, the effect described in literacy research as the "Matthew effect", where the "rich get richer" and the "poor get poorer" (Stanovich, 1986) may begin much earlier in the domain of language development. Correspondingly, Hart and Risley (1995) have suggested that children who have a greater amount of language exposure prior to age 3 years, display better vocabulary outcomes, in comparison to children who have received limited language input in their early years. In the current study, it is likely that those children who receive a greater amount of exposure to language at 6 months of age have an increasing amount of input at 15 months of age, whereas those children who have less input at 6 months may receive proportionally less input at 15 months. Clearly these varied experiences will influence children's development over time.

From a transactional perspective (Sameroff & MacKenzie, 2003), the benefits to those children who receive more language input from their mothers are apparent, as these children have more opportunities to respond, thereby influencing their mothers. When children demonstrate increased abilities, mothers respond accordingly and adapt their language, supporting theories of socio-cultural development (Bornstein et al., 1999; Rowe et al., 2005; Vygotsky, 1978).

Number of different words. In addition to being important for children when they are 6 months of age, the number of different words used by mothers in the current study at the 6

month time point has relationships with mothers' number of different words at the 15 month time point. In particular, the number of different words used by mothers is relevant in combination with other measures of maternal language at the 6 month time point in predicting mothers' number of different words at the 15 month time point. In fact, the overall model explains approximately 27.7% of the variance in number of different words at the 15 month time point. However, it is difficult to determine the unique role of the number of different words used by the mothers at the 6 month time point since it did not reach a level of statistical significance as an individual parameter in the overall model that included control variables and other aspects of maternal language. Research from Pan and colleagues (2005) suggests that mothers who consistently use a greater number of different words have children with greater productive vocabularies. The finding from the current study provides evidence that no single factor could be used, but rather a combination of maternal language variables at the 6 month time point is necessary to predict mothers' number of different words at the 15 month time point. Moreover, the number of different words used by mothers at the 6 month time point did not contribute significantly in additional models predicting the other maternal language outcomes at the 15 month time point. It seems that the number of different words that mothers use at the 6 month time point may share variance with other factors, and thus, alone may not have the power to predict later maternal language use. In contrast, the control variables of maternal education and income-to-needs ratio were significant individual parameters in the overall model that predicted mothers' number of different words at the 15 month time point, demonstrating the influence of distal environmental factors on mothers' language use (Bronfenbrenner & Morris, 1998).

Analyses involving the number of different words spoken by mothers at the 6 month time point and children's communication outcomes from the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002) at the 15 month time point did not identify any significant relationships. In addition, the number of different words used by mothers at the 15 month time point did not predict children's performance on the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002), whether considered with other maternal language variables, or as a single predictor (with control variables). Perhaps, the limited relationship between maternal and child communication is related to difficulties in using only maternal vocabulary to attempt to predict the range of communicative skills represented by the Composite Standard Scores of the *CSBS DP Infant-Toddler Checklist*. It is also possible that the differences in distributions of the Composite Standard Scores in the current sample, in comparison to the normative sample, influenced these analyses. On the surface, these findings appear to conflict with existing research that demonstrates a relationship between the number of different words that mothers use and children's language abilities (e.g. Hart & Risley, 1995; Hoff & Naigles, 2002; Pan et al., 2005); however the extant literature involved older children and often used a measure of children's vocabulary as the outcome, something that is difficult when children are 15 months old. Additionally, in this sample a majority of the children at the 15 month time point did not produce any words during the book sharing interaction, limiting efforts to examine their vocabulary or to identify relationships between mothers' language use and the children's vocabulary. The current study provides important information regarding the utility of measuring several aspects of maternal language input and child communication outcomes in future research, particularly with families from low income and rural environments, as the number of different words as a single predictor may

not be sufficient to explain variation in the communication outcomes of these very young children.

Length of utterance. In the current study, the average number of morphemes mothers used in each utterance (MLUm) served as a measure of variation in syntactic complexity during book sharing interactions. The mothers in this sample did not alter the average length of their utterances over the two time points, a finding that is similar to other studies involving young children (e.g. Kavanaugh & Jirkovsky, 1982). It may be that mothers at both the 6 and 15 month time points were more aware of simplifying their language use according to their children's interest, attention, and communication abilities, especially given the small number of children who communicated with words and gestures during the book sharing interactions. The mothers' awareness of the limited word use of their child would provide one possible reason that mothers' maintained stable MLUm over these time points, without necessarily increasing their length of utterance over time, as had been found in research involving older children (Snow, 1972). Furthermore in this sample, maternal syntactic complexity did not significantly predict any of the Composite Standard Scores of the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002), although past research has suggested relationships between maternal MLU and children's vocabulary (e.g. Hoff & Naigles, 2002). It may be that the different findings are due solely to the limited variability in the income levels of the families in the current study, whereas Hoff and Naigles (2002) involved families with more disparate income and education levels. As with the number of different words used by the mothers, it may be that maternal MLUm did not significantly predict the Composite Standard Scores due to departures from normality of children's scores

in the current sample, as well as the unique characteristics of the mothers in the current sample.

Analyzing the Content of Mothers' Language

Of all of the content level variables used to represent maternal language in the current study, the two that occurred most frequently at both the 6 and 15 month time points were (a) Encouraging Attention and Continuing the Interaction and (b) Labeling. Not surprisingly, these same codes represented the highest proportions of language strategies in mothers' language use. As described in the Coding Manual in Appendix A, Encouraging Attention and Continuing the Interaction was the variable that represented the utterances that mothers used to gain or maintain their children's attention to the task, to acknowledge children's participation, and to provide positive feedback. The variable of Labeling was documented when mothers used words to label objects, events, or actions. These findings indicate that during book sharing interactions with their very young children, mothers were mostly using language that was focused on maintaining their child's attention and providing labels. Since infants and toddlers do not sustain their attention for long periods of time, mothers would very likely need to frequently use these forms of utterances to regain their children's attention and to encourage their continued participation in the task. These results are consistent with those reported by van Kleeck et al. (1996), who also identified that the most frequently occurring maternal behaviors during book sharing interactions between mothers and infants served the purpose of gaining and maintaining their infants' attention.

The relatively high proportion of Labeling in the current study also suggests that mothers were interested in providing their children with the labels of items in the books and were perhaps supporting their children's vocabulary development. This finding parallels the

results of earlier research that also has documented mothers' use of labeling during book sharing (e.g. DeLoache & DeMendoza, 1987; Ninio & Bruner, 1978; van Kleeck et al., 1996). More specifically, these forms of utterances are also part of the routine that some mothers create during book sharing (Sénéchal, Cornell, & Broda, 1995; Ninio & Bruner, 1978) and document the scaffolding techniques that are considered to be important for children's language development (Bruner, 1981; Vygotsky, 1978). It is also possible that the relatively high proportion of labeling is reflective of the characteristics of the books themselves. The books used at the 6 and 15 month time points did not have text, and were selected to be of interest relative to very young children's development. Any text that appeared in the original versions of the books had been removed for the purposes of the study. There were pictures on every page, with the book at the 6 month time point featuring young children expressing different facial expressions and the book at the 15 month time point showing a character in varied situations and corresponding objects depicted on each page. The limited text available and the format provided by the books may have led mothers predominantly to label the items in the pictures on each page.

Mothers in the current study used few prohibitions in their interactions with their children, so that prohibitions occurred less than once per minute. Unfortunately, the current study does not allow for comparisons to be made with studies of families of higher incomes, such as those that have indicated that mothers from families with low incomes use more prohibitions (e.g. Hart & Risley, 1995). It is informative, however, to learn that prohibition occurred less frequently than several other forms of utterances in the current sample of mothers and their children who were from low income environments. Recall that mothers in this study could choose to end the interaction whenever they (or their child) needed to do so.

Perhaps this flexibility in defining the duration of the book sharing interaction allowed them to be more focused on the content of the book, and when it seemed as if their child was not attending or interested, they could end the interaction, therefore, diminishing the need to use prohibitions.

In the current investigation, mothers rarely answered their own questions in the book sharing interactions with their children. For this reason, the variable, Answering Own Question, was not included in the analyses. The limited use of this code may contrast with earlier research (DeLoache & DeMendoza, 1987; van Kleeck et al., 1996). Although these two studies included this code in their overall analyses, it did not appear to be a critical component of their findings. For the current study, mothers' minimal use of this form of modeling may have implications for their children. Specifically, DeLoache & DeMendoza (1987) suggest that mothers who often answered their own questions were also providing experience with a question-answer format. Additionally, children with parents who model and teach children the skills that are valued at school are more likely to demonstrate academic success (e.g. Heath, 1982). However, little research is available to indicate if these forms of parental modeling to infants are particularly relevant to later communication, as DeLoache & DeMendoza's (1987) research was conducted with the youngest children around 12 months of age and did not measure relationships with children's outcomes. It may be that mothers' increased use of utterances that relate to gaining and maintaining children's attention, labeling pictures, and asking for children's participation reflect mothers' beliefs about the importance of these particular behaviors in encouraging children's development. In addition, if mothers spend a good proportion of their time engaged in these kinds of strategies, they may have less time overall to use more elaborate ones.

In regards to the Elaborated Strategies (Adding Information Beyond the Book, Relating the Book to Child's Life, and Attributing Meaning to Child Action or Behavior), it was noted at both time points that there was little variance in the mothers' use of these forms of utterances. It is not surprising that mothers in this sample were more likely to utilize more immediate and concrete forms of utterances than abstract language, given the age and limited verbal language use of their children. These findings support research from van Kleeck et al., (1997) and DeTemple (2001) that indicated that parents of preschoolers mainly used more concrete forms of language during their book sharing interactions. In fact, it adds evidence to support the idea that perhaps these mothers were adapting their language according to the developmental level of their children. Further, Pellegrini and others (1990) noted that parents tend to use more concrete language strategies with their children when reading text in unfamiliar formats, thus these mothers may have been responding to their knowledge of their children's limited familiarity with the book sharing experience.

Content level variables and differences over time. The design of the larger Family Life Project allowed participants to engage in the book sharing interaction for varying durations. Due to this feature, there were wide ranges in the duration of book sharing interactions at each time point, yet the average durations were similar across time points. However, the maximum duration at the 15 month time point (around 10 minutes) was approximately double the maximum duration at the 6 month time point. Similarly, there were wide ranges in the number of maternal utterances produced at each time point and the highest number of utterances increased by approximately 49% at the 15 month time point. The wide range of maternal utterances and varying durations of book sharing interactions are

very likely related to each other. Therefore, rates of use of content level variables were computed to account for the potential influence that duration may have had on relationships.

In the examination of changes across time points in the rate of use of the individual content level variables (within the set of Immediate Strategies), significant positive differences were noted for Rate of Labeling and Rate of Seeking Participation. Since the analyses involving the set of Immediate Strategies were conducted with rate versions of the variables, it provides evidence that these changes in mothers' language were significant after accounting for varied durations of book sharing sessions. The finding that mothers' Rate of Labeling increased over time supports the previous finding of changes in the number of different words mothers used over time. It seems likely that mothers' increase in number of different words may be partly related to their use of more labels with their older children. From a developmental perspective, at the 15 month time point, mothers also may have recognized their children's growing ability to identify items by pointing, and their emerging use of words and capability to perform actions; accordingly mothers were providing more utterances intended to seek their child's participation. It may be that mothers use these forms of utterances in an effort to engage their children, or respond to their children's interests within the book sharing interaction.

The fact that no statistically significant differences were found between the 6 and 15 month time points in mothers' use of strategies to encourage attention or continue the interaction is of interest, as it may suggest that at both time points, mothers extended a great deal of effort to keep their children engaged and attentive. Even though the difference did not reach statistical significance, the trend was for mothers to use a higher rate of this language strategy at the 15 month time point. The current study supports evidence from

other studies that have documented this pattern in mothers' language use (Sénéchal et al., 1995; van Kleeck et al., 1996). It is also possible that for this sample, children's characteristics (e.g. more mobility at 15 months) and the nature of the task may have influenced mothers' use of strategies to maintain attention.

There were also overall differences across time in the use of the set of Elaborated Strategies. Specifically, there were significant differences in (a) Rate of Adding Information Beyond the Book, (b) Rate of Relating the Book to the Child's Life, and (c) Rate of Attributing Meaning, with effect sizes ranging from small to medium. The changes, however, were such that mothers were actually using a lower rate and proportion of these Elaborated Strategies at the 15 month time point. It may be that the limited communication rates and lower verbal skills of the children during the interactions influenced mothers' infrequent use of these Elaborated Strategies. In contrast, with preschool age children, DeTemple (2001) reported that the proportion of non-immediate talk (representing more elaborate, abstract language) increased with time. For the current sample, it is possible that at the 15 month time point, because the children were more independent in their mobility, mothers used few of these Elaborated Strategies and spent more time focusing their child's attention. The influence of several domains of development suggests an interactional influence, where the combination of children's abilities relates to both the input they receive and their own communication abilities (Chapman, 2000). In addition, mothers' interpretation of children's abilities may have led them to use more utterances that represented Immediate Strategies. As the children were more likely to be displaying communicative functions at the 15 month time point (whereas few 6 months olds are), the children most likely were able to indicate functions that included commenting, requesting an object or action, or protesting,

using a greater variety of communicative means. Maternal responses to these common communicative functions are more likely to fall within the set of Immediate Strategies (e.g. Labeling, Encouraging Attention or Continuing the Interaction, Seeking Participation, or Using Prohibitions) than the set of Elaborated Strategies which represent more abstract content. Therefore, it is possible that mothers' relatively higher rate of use of the Immediate Strategies and lower rate of use of the Elaborated Strategies represents their responsivity to their children's communication abilities. Alternatively, mothers' increased use of Immediate Strategies may have been the result of their perceptions regarding expectations from the research team. Mothers may have believed that it was more important to go through all the pages in the book and therefore used more concrete language, rather than more abstract language to discuss the book. Another possibility is that the maternal characteristics of education and income level influenced maternal language use. This possibility is supported in part by the fact that maternal education and income levels at the 6 month time point were predictive of mothers' number of different words at the 15 month time point. Mothers who use a greater number of different words are likely to have more utterances that are classified as Elaborated Strategies as evidenced by the positive correlations between these variables at the 15 month time point.

Significant differences were also noted in mothers' rate of Using Book or Print Conventions between the 6 and 15 month time points. The results indicated that mothers significantly increased their use of these forms of utterances at the 15 month time point, with an average of approximately 2 utterances per minute that were identified as Using Book or Print Conventions, rather than 1.5 utterances per minute at the 6 month time point. Overall, mothers' language at the 15 month time point included more vocabulary specific to book

sharing and talking about elements of books. For example, mothers were more likely to read the title of the book, say "The End" after completing the book, and encourage children to participate in the book sharing interaction by turning the page. Some mothers also made reference to the sequential nature of a book, by indicating that more information could be obtained as pages were turned. Given the importance of print referencing as a strategy to develop important emergent literacy understanding in young children (Justice& Ezell, 2002: Justice, Mattingly, Ezell, & Bakeman, 2002), evidence of this increased attention to the book itself as early as 15 months is encouraging.

Language strategies and children's communication outcomes. Unexpectedly, neither mothers' rate of use of Immediate Strategies nor mothers' rate of use of Elaborated Strategies at the 6 month time point were found to relate to children's communication outcomes (Composite Standard Scores from the *CSBS DP Infant-Toddler Checklist*, Wetherby & Prizant, 2002) at the 15 month time point. In considering explanations for this finding, it is possible that these results were obtained as relatively more children in the current sample had lower Composite Standard Scores than the children in the standardization sample. The findings may also suggest that within a sample of families from low income environments, measures of mothers' use of language during book sharing (especially on only one occasion) at the 6 month time point may not represent all aspects of mothers' communicative behaviors that support children's beginning communication abilities. It may be that with infants, more specific components of mothers' responsiveness may be important in children's communication development, as suggested by Masur and others (2005). An alternate possibility is that the book sharing context may have been an unfamiliar one for these families with their 6 month old infants, and consequently maternal language use during the

interaction did not adequately reflect the type of input provided in other situations. For these families, perhaps maternal language within more frequently occurring social contexts in the daily routines of these infants would be particularly relevant for children's later communication. The videotaping component of the data collection process (and "performing" in front of strangers) also may have influenced both the mothers and the children in the sample.

Finally, in examining the potential concurrent relationships between maternal content variables and the Composite Standard Scores of the *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002), the results were mixed. Despite the fact that variables representing mothers' language content did not predict the Social or Speech Composite Standard Scores, maternal rate of use of Immediate and Elaborated Strategies at the 15 month time point did show a trend towards predicting the Symbolic Composite Standard Score. It may be that the variation between the current sample and the standardization sample on each of the other two Composite Standard Scores influenced this finding. Additionally, the Social and Speech Composite Standard Scores documented children's abilities to produce gestures, sounds, and words, however, the children in the current sample were observed to produce less of these forms of communication during the book sharing interaction. Recall that the Symbolic Composite is made up only of the children's understanding of object and people names and their type of play with objects. It is possible that there was more variance in the Symbolic Composite Standard Scores since these skills were not affected by the limited communicative attempts of the children and therefore may have been less challenging for the children than those in the other Composites. In the results of the hierarchical regression analysis with the Symbolic Composite Standard Score as the outcome variable, it was noted

that mothers' rate of use of Elaborated Strategies had the highest standardized beta coefficient, although there was no overall statistical significance for the model that included all maternal variables ($p = .061$). The additional hierarchical regression analyses indicated that a model with only the rate of use of Elaborated Strategies at the 15 month time point was statistically significant in the prediction of children's Symbolic Composite Standard Score, beyond the contributions of maternal education and income-to-needs ratio. As it was the only 3-variable model that was statistically significant, it suggests that mothers' rate of use of Elaborated Strategies may be important in children's communication development, supporting research from DeTemple (2001) that identified relationships between mothers' more abstract talk and children's receptive vocabulary outcomes. This early link between mothers' elaborated language use and children's comprehension may have an influence on children's later language abilities (Fewell & Deutscher, 2004).

Characteristics of Early Communication in Young Children

In addition to examining the characteristics of mothers' language use to their children, the current investigation also documented the children's communication abilities at the 15 month time point in order to investigate the potential relationships between maternal language use and children's abilities. Specific research questions looked at the potential predictive relationship between maternal language at the 6 month time period and child communication outcomes at the 15 month point as well as the concurrent relationship between maternal language and child communication outcomes at the 15 month time point.

The children's communication outcomes were obtained from *CSBS DP Infant-Toddler Checklist* (Wetherby & Prizant, 2002) Composite Standard Scores and from SALT transcripts (Miller & Chapman, 2004). In regards to the Composite Standard Scores, no

significant relationships were identified with these outcomes, using maternal language predictors from either the 6 or 15 month time point. One possible explanation for these findings may be related to the characteristics of the children in this sample. Recall that the children in the current study generally had a greater proportion of scores at the lower values when compared to the standardization sample. Differences among the distributions of the three Composite Standard Scores within the current sample also may have contributed to the findings. The approximately normal distribution of children's Symbolic Composite Standard Score may explain in part why more relationships were evident between mothers' language use at the 15 month time point and concurrent child communication when utilizing this Composite Standard Score as the outcome variable rather than the other two Composite Standard Scores. Children may also have displayed relatively better standard scores on the Symbolic Composite as it described their comprehension and early object use, instead of the expressive communication skills that were the basis of the Social and Speech Composite Standard Scores.

Several findings regarding the children's communication during book sharing, obtained from the SALT transcripts (Miller & Chapman, 2004), were unique to this sample and therefore may have had an influence on various analyses. First, approximately 73% of the children did not produce any words during the book sharing interaction. Although there is variation in the ages at which most children begin to use words (Fenson et al., 1993), it is unusual for such a significant proportion of the study children (even in such a brief interaction) to have used no words during the book sharing interactions at age 15 months. Second, there was a relatively high proportion (approximately 39%) of children who did not use any gestures during the book sharing interaction. Again, at this age, it has been

documented that children commonly use a variety of gestures with or without vocalizations to communicate at this stage in their development (Crais et al., 2004; Wetherby et al., 1988). Finally, the children in this study used a relatively low rate of communication during this interaction. Specifically, more than half (approximately 57%) of the children had fewer than 10 attempts to communicate in any form (gestures, unintelligible words, actual words). When the children's rate of communication per minute was examined, there were 34 children (approximately 41% of the sample) who were estimated to use fewer than two communication attempts per minute. Of these 34 children, 13 (16% of the sample) did not produce any communication attempts and 9 (11 % of the sample) had rates of communication that were estimated to be greater than zero but less than one communication attempt per minute. Thus, there was a high proportion (27%) of children in the current study whose rate of communication was estimated to be less than one communication attempt per minute. In contrast, research from Wetherby and colleagues (1988) has indicated that children around 15-19 months of age use approximately two communicative acts per minute, and children around 11-14 months of age use one communicative act per minute. Although the sample identified in the current study had a mean age of 15.4 months, they clearly had a lower rate of communication than is commonly expected from children at a similar age (Wetherby et al., 1988).

It is possible that the children did not demonstrate the range of their abilities during the brief book sharing task, perhaps explaining why their abilities may have been rated differently by their mothers on the *CSBS DP Infant-Toddler Checklist*. The children may have been less communicative due to the presence of a home visitor and the videotaping procedure, or due to their potentially different or decreased experiences with book sharing

interactions. If, however, the findings from the current sample are representative of these children's typical communication abilities, there are possible negative implications regarding the communication development of these children with relatively low rates of communication. For example, Fish and Pinkerman (2004) found in a rural sample that children who had larger productive vocabularies at 15 months were more likely to have average language scores at ages 4 and 5 years, whereas children with smaller vocabularies displayed lower language scores on testing at age 4 and 5 years.

In summary, the children in the current sample did not produce much expressive communication during the book sharing interaction (e.g. approximately 73% did not use words, 39% did not use gestures), and therefore, their communication practices were not analyzed in detail. The variation present in maternal language use during book sharing suggested that the Caucasian children within this low income, rural environment were exposed to vastly different maternal language input, in terms of both the structure and content of maternal utterances, similar to findings in other research (e.g. Rowe et al., 2005). Much of the existing research that involved families from low income environments included children who were either preschool-age or older (e.g. DeTemple, 2001; Tizard & Hughes, 1984; Snow et al., 1991; Vernon-Feagans, 1996). Consequently, these studies have described variability in children's use of narratives, their language comprehension, and their vocabulary skills. Although these measures were not documented due to the young ages of the children in the current sample, some of the similarities in the characteristics of the mothers between the current study and existing research suggest that there may be comparable levels of variability in the children's future language abilities.

Factors Influencing Development

Due to the previous research literature indicating that income levels and maternal education are often related to parents' language use and children's development, the current study purposefully controlled for these distal factors in analyses. In addition, the sample had been selected to include only those families who had incomes that were less than 200% of the poverty threshold. With respect to maternal education, there was a wide range of education level in the sample, but a number of the participants (approximately 18-22%) had not completed high school or obtained a GED. Similar findings were noted in national data, with 17% of Caucasian females above age 18 years living outside metropolitan areas, without a high school degree/GED (U.S. Census Bureau, October 2006). In this way, the current sample appears to represent national trends, although subtle differences between the current sample and national data lead to more apparent differences at the upper end of the education attainment scale. In particular, mothers who had a college degree represented only 7% of the current sample, but approximately 16% of Caucasian females living outside metropolitan areas in the national census had obtained a college degree (U.S. Census Bureau, October 2006). The lower levels of maternal education that were evident in the current sample could have influenced characteristics of maternal language use, and potentially led to a decreased use of abstract language than what would have been found in a sample of mothers with higher levels of education. Moreover, as indicated in the Results section, the educational profile of the standardization sample of the *CSBS DP Infant-Toddler Checklist* included a significantly higher proportion of mothers with a college degree (52.1%). Due to the striking contrast between the educational achievement of the current sample and standardization sample, comparisons are difficult to make. Further, mothers' levels of education may have

influenced their approach to the book sharing activity. Specifically, the mothers may have focused on performing the task, rather than their own language or the process of the interaction, subsequently altering their input during the data collection process. Education level may also influence maternal practices such as frequency and duration of book sharing interactions, and those mothers with less experience in book sharing interactions may have had some difficulties in this activity, especially as the task was videotaped and part of a research study.

Although in most of the current analyses, the distal factors of maternal education and income-to-needs ratio did not explain significant variance in either maternal language outcomes or in child outcomes, there were a few exceptions. First, in the analyses examining prediction of the number of different words mothers used at the 15 month time point based on variables from the 6 month time point, both maternal education and income-to-needs ratio were each significant contributors in the overall model, whereas the maternal language variables were not significant as individual parameters. Thus, the variables of maternal education and income-to-needs ratio from the 6 month time point appear to be relevant predictors of mothers' number of different words at the 15 month time point even in the presence of other maternal language variables. Second, when combined, maternal education and income-to-needs ratio from the 15 month time point contributed to a significant prediction of children's *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score. Although the individual variables of maternal education and income-to-needs ratio were not significant, together they explained a small (approximately 5.4%), but significant amount of variance in the child outcome variable. These findings lend support to theories that have advocated for consideration of different distal factors as potential contributors to

children's development (e.g. Bronfenbrenner & Morris, 1998). The reduced variance in education and income levels may explain in part the findings in the current study of few relationships between these factors and children's outcomes.

Limitations of the Current Study

There are some limitations in the current study that may have influenced the results. Specifically, there may have been some inherent sample bias in the participants. Although the families in this study were randomly selected, as a group the participants may be different from other families with low incomes who did not participate in the larger Family Life Project. For example, families who agreed to participate in the larger Family Life Project investigation may display greater confidence in new situations and be more comfortable with expressing themselves (and being videotaped) in front of unfamiliar people. In this way, these mothers may have demonstrated more language use than other mothers with low incomes who did not participate in the Family Life Project.

Moreover, mothers' responsiveness was not specifically measured during the book sharing activity. The language strategies were intended to describe the content of mothers' utterances, but did not incorporate particular features of responsiveness; therefore, the addition of more specific variables to describe this maternal quality may have been useful. There is some evidence that certain components of maternal responsiveness to infants are related to later child language abilities (e.g. Masur et al., 2005; Tamis-LeMonda et al., 2001). In particular, documenting verbal or physical responsiveness as well as supportive or intrusive directiveness in mothers' responses may help predict children's later communication skills. Additionally, considering the child behaviors that preceded maternal

language use would lead to a more complete understanding of the relationship between maternal language use and child language development.

The current study only included a single episode of book sharing at each time point. Therefore, it was difficult to determine if this particular interaction was representative of other mother-child book sharing experiences. Mothers' level of familiarity with both the book sharing process and the specific books utilized during this study also may have influenced maternal language utilized in the session. The study did not specifically ask parents about the frequency or duration of typical book sharing interactions, thus it is impossible to assess how representative these interactions were. Further, there may be issues concerning the amount of data available from only one book sharing session at each time point (Price & van Kleeck, in preparation; van Kleeck, 2003). It may be that maternal language use and children's communication are stable over several sessions or contexts, but there is also the possibility that participation may be vary across sessions and types of books.

Another possible limitation in the current study may have been the outcomes used to document children's communication. The main measures of children's communication at the 15 month time point (obtained through maternal report) were standard scores from the *CSBS DP Infant-Toddler Checklist.* Unfortunately, there was variation between the current sample and the standardization sample in the education level of the mothers that may have led to potential differences in children's scores. It is also possible that mothers who live in rural environments may provide responses for a parent report assessment that reflect their restricted experiences with young children, isolation from other mothers with young children, and decreased access to community resources.

It is clear that a limited range of values influenced the child communication outcome variables that were computed based on SALT transcripts (Miller & Chapman, 2004). All three of these variables, (a) the total number of child communication attempts (b) the number of different words produced, and (c) the total number of gestures, deviated from the normal distribution. In each case, these variables were skewed such that a disproportionate number of children produced few or none of each of the outcomes measured. This lack of variability in scores across these three outcomes certainly influenced their use in attempts to predict child outcomes based on maternal language use.

Despite these limitations, the current study contributes to the research literature regarding maternal language use with young children during book sharing in several ways. First, it has provided evidence of significant variability in mothers' language use within a sample of families who are from low income and rural environments. Second, this research has identified potentially important differences (and similarities) in these mothers' language use between the 6 and 15 month time points. Documenting these changes in a prospective, longitudinal design also adds to our knowledge of the kinds of changes mothers make in their language use over time. Third, the current study has suggested that there are multiple factors that contribute to children's communication development, with some maternal language strategies identified as relevant in predicting concurrent aspects of children's communication. Specifically, maternal rate of use of Elaborated Strategies at the 15 month time point was a significant predictor of children's concurrent symbolic communication. In addition, the study highlighted the influence of education level and income in the prediction of mothers' diverse vocabulary, an essential characteristic of maternal talk for older children (Hart & Risley, 1995; Pan et al., 2005). Finally, the current study also demonstrated that children in

this sample produced relatively lower levels of communication, a finding that has implications for their later language abilities.

Future Directions for Research

In future research, it may be of importance to examine mothers' language use to understand how they establish routines in book sharing with their young children. One aspect to explore would be to analyze mothers' language use beyond the level of the individual utterance and look for patterns across utterances. Although there has been evidence that mothers use particular forms of utterances during book sharing that create a predictable sequence or routine, few studies have analyzed these routines within a sample of families who have low incomes. Longitudinal research projects would provide an opportunity to examine the dynamic nature of these routines at different developmental time points

Moreover, it will be beneficial to consider utilizing different analytical methods that allow prediction of children's communication abilities as measured within the book sharing interaction. For example, determining the combination of factors that predicts children's production of at least one word or their rate of communication would provide helpful information regarding children's development in families who are from low income and rural environments. It may be that comparing children with higher rates of communication to those with lower rates of communication will reveal differences based on a combination of parental factors.

Rather than only examining children's communication as an outcome, future analyses involving measurement of children's attention or interest during the book sharing interaction may offer a perspective on predictors of children's early literacy abilities. Specifically, it

may be of value to analyze relationships between maternal language strategies and young children's attention to the book during the interaction and identify what aspects of maternal language use contribute to children's attention or engagement. Including infants and toddlers would extend previous research that has suggested that children's attention and engagement during book sharing is predictive of their later language and literacy abilities (Crain-Thoreson & Dale, 1992).

Future research that extends the analysis of maternal behaviors during book sharing to include measures of responsiveness (behavioral and verbal), directiveness (supportive and intrusive), and maternal warmth could provide a more comprehensive view of the interaction, and may offer a better model to predict children's early and later communication development. Likewise, documenting parents' literacy beliefs and their past literacy experiences with their young children may be helpful in determining how these factors influence book sharing interactions with infants and toddlers. In addition, several other factors related to parenting behaviors and stress may have relationships with parents' language use, as well as the frequency and duration of book sharing interactions in their typical routines.

Furthermore, there is a need in future research to consider the contributions of children to the book sharing interaction and parents' behaviors. In particular, children's interest, responsiveness, and enjoyment during book sharing may have an influence on parental language use and the duration of the book sharing session. Children who display lower levels in any of these areas may have caregivers who utilize more varied or different forms of language to engage their children than caregivers with children who display higher levels of these characteristics. Additionally, children who are less responsive or who do not

enjoy the book sharing process may have parents who read with them less often, have fewer opportunities to establish book sharing routines, and therefore display shorter interactions during book sharing tasks especially when used for research purposes. Understanding the impact of these and other child characteristics could contribute significantly to our understanding of the relationship between parent and child language.

Additional research that involves a greater diversity of participants, in terms of income and cultural background will be useful in understanding how these factors influence both parents' language use and children's communication. Moreover, increasing the number of participants will also allow for complex statistical modeling and analyses examining changes over time, with improved ability to detect smaller effects.

Conclusion

The main purpose of the current study was to examine maternal language use with their young children during book sharing interactions at the 6 and 15 month time points. Specifically, the study analyzed differences in maternal language across the two time points and also investigated relationships between maternal language use at both time points and children's communication outcomes at the 15 month time point. For the current study 82 mothers and their children who were living in low income, rural environments were randomly selected from participants in the larger Family Life Project. The families were followed in a prospective, longitudinal investigation that documented a variety of family and child characteristics from interviews, developmental tasks, and assessments that were conducted during home visits. The current study focused specifically on the book sharing

interactions that were completed during home visits at the 6 and 15 month time points, as well as the child communication outcomes measured at the 15 month time point.

The results of the current study indicated a great deal of variability in mothers' language use within time points as well as in the duration of book sharing sessions. Additionally, there was evidence of significant differences in maternal language use between the 6 and 15 month time points. In particular, there were changes in both structural and content level language used by the mothers during the book sharing interactions. Another significant finding was the concurrent predictive relationship between mothers' rate of use of Elaborated Strategies and children's communication as measured by the *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score, beyond the contributions of maternal education and income level. The current analyses did not identify other significant relationships between measures of maternal language use at the 6 month time point and children's communication abilities, however, issues related to sample characteristics may have been a factor in these results.

There are several implications that emerge from these findings. First, the variation in maternal language use and duration of book sharing sessions was noteworthy, and has consequences in terms of children's experiences with language and book sharing. Second, this sample included children who displayed limited communication as recorded during the book sharing interaction. This finding warrants greater investigation regarding the factors that may be common to this group of children. Third, the apparent modifications observed in mothers' language use over time may indicate that mothers consider their children's abilities when they encourage their children's participation and attention through increased use of certain maternal language strategies. Finally, examination of maternal language use and

children's communication identified one significant predictive model, and suggests the presence of specific relationships between particular aspects of maternal language and child communication.

APPENDIX A: CODING MANUAL

Operational Definitions for Caregiver Language Codes for 6 months and 15 months

General Conventions of the Family Life Project SALT Transcripts

- Codes should be entered in square brackets like the following "[APPROPRIATECODE]"after the text of the utterance and before the punctuation mark. Be certain to leave a space after the last word and the first square bracket. Do not leave spaces within the square brackets. All codes will be typed in capital letters.
- If there is more than 1 code for the utterance, there should be a space between the square brackets that end one code and begin the next.
- When you see the word "child", especially when it is typed with an initial capital letter "Child", it likely refers to the name of the child. Sometimes these utterances may be coded in the Encouraging Attention and Continuing the Interaction category or may fall into the Relating the Book to the Child's Life category.
- Sound effects are typed with a "%" symbol preceding the sounds.
- When you see titles or authors of books, use the code for Using Book Conventions.
- The following words typed together are examples for the book used at age 6 months: BabyFaces or Babyfaces or Baby_faces.
- The following words are examples for the book used at age 15 months: NoDavid! or NoDavid or No_David. The author of the book "No David!" is David Shannon, so the author's name may be typed as one word (DavidShannon, David_Shannon) or as two words (David Shannon).

- It may be appropriate to use context to code the utterance. Always read 2-3 utterances immediately before and after the target utterance to get a better idea of the interaction. Mark any uncertain utterances and review on the DVD to make final decisions.
- Code only complete and intelligible primary caregiver utterances.
- Do not code mazed utterances. Mazed utterances are exact repetitions of a previous utterance by the same speaker and will be surrounded by round parentheses.

  E.g. P Oh goodness.

  P (Oh goodness).
- Do not code utterances that have an "xx" in the Primary Caregiver's utterance.

  E.g. P He/'s xx get/ing the cookie/s.
- Do not code utterances that abandoned or interrupted.

  These will end with the following symbols: > or ^

  Abandoned Utterance E.g. P He/'s in the>

  Interrupted Utterance E.g. P It/'s a^

  C {xx xx} [UNINT].
- Do not code child utterances.

  E.g. C Ball.

  C {xx} [UNINT] [POINT].

  – note that some child utterances at 15 months will have non-verbal codes.

Coding System

The coding system is based on classifying the caregiver language strategies into two groups. Immediate Strategies are those relying on referents that are immediate or present in

the environment (Blank et al., 1978; DeTemple, 2001; Snow, 1991; van Kleeck et al., 1997). Immediate Strategies typically utilize more concrete language and less abstract language. Elaborated Strategies are caregiver utterances that utilize more abstract language and require additional information to what was available from the pictures within the book (Blank et al., 1978; DeTemple, 2001; Snow, 1991; van Kleeck et al., 1997). In addition to these two groups of language strategies, Using Book or Print Conventions will be an additional aspect of caregivers' language documented in the book sharing interactions.

Immediate Strategies (5)	
Name of Code	*Definition*
Labeling Examples: There's a ball. He's got a ducky. Chicken. Look at the baby faces. See the doggie? Do you see the baby? He's smiling. He's eating. He's taking a bath. Is that the duck? Animal sounds (%meow %quack) Sounds that label actions (%bang) Messy Clean Dirty Theend. All done.	The caregivers produce words to label an object, event, or action in the book. These utterances are more basic and may include aspects of objects or other characteristics. The utterances are concrete in that they are directly from the pages of the book or in the immediate surroundings. They may also include questions in the form of "Do you see the….?", "You see the…?", "Is that the…?", or " Is the …". These types of Yes or No questions are really intended to focus on the description of the object, event or action. Most Yes or No questions will either be in the Labeling category or the Adding Information category. Some Yes or No questions – such as Can you find the ducky? or Can you … - will be coded as Seeking Participation. Names of familiar games such as "peekaboo" or "so big" will be coded as Labeling.
Seeking Participation Examples: What's this? Where's the ducky? What's he doing?, What's going on? Who questions, Where questions, Why questions Are you all done?	The caregiver requests names of item/actions or requests identification of items/action. These may be rhetorical questions, since at early ages child can not produce the required word(s) or gestures. It may be that caregivers are modeling the routine of participation. It may be a way of inviting the child's participation (vocal, non-verbal, or verbal) in

All done? Let's turn the page. Let's read a book Let's find out what happens. Do you want to… Do you like … Commands: You hold it, Turn the page, Kiss the baby Say "ew", say "ball", etc.	the book sharing interaction. This category also includes requests from the caregiver for the child to imitate or repeat an action, sound or word.
<u>Providing Answer to Own Questions</u>	Caregiver answers a question that he/she (the caregiver) just asked. This seems to be a way of modeling the question-answer sequence as well as providing information in this format. Do NOT use this code if there is any type of child utterance after the caregiver question because it will be difficult to choose if it was an Answer to Own Question, or another code (Adding Info, or Labeling, etc.).
<u>Using Prohibitions</u> Examples: No, Don't do that, don't eat it, don't rip it , Not in your mouth Mhmh, Uhuh, Hold on, Wait a minute, Wait, You're not cooperating, Keep your hands off the book	Caregiver utterances that are conveying directives to the child to stop or prevent certain actions or behaviors. Prohibitive utterances are considered reactive/negative.
<u>Encouraging Attention and Continuing Interaction</u> Examples: Look Oh Look here Child's name Come here	These utterances serve several purposes: 1) to gain or maintain the child's attention to the task, 2) to continue the interaction without adding additional content related to the book (e.g. acknowledge child utterance), and 3) give positive feedback
Uhoh Oops Here Look at that. See that? See?	Utterances may be commands. These utterances <u>do not</u> contain labels of pictures, actions, etc. and <u>do not</u> include the following: "What's that?" "What's he doing?", and other Wh- questions.
We ready? Let's see. Examples: Yes, Mhm, , Uhhuh, Huh,	Utterances may acknowledge children's vocalizations or gestures.

Hmm Praise – Good job, very good Some behavior management without negative meaning: You can have it Sound effects that are for attention – e.g. gasping (%Ah!), saying "Aw" DOES NOT include sound effects that label the sound an animal makes or sound effects in place of an object – e.g. %Vroom is Labeling - Is that a %meowmeow – Labeling Exact imitations of child vocalizations/words	Caregivers may produce exact imitation of child vocalizations or words. This *is not* Adding Information because it does not involve repeating parts of a child utterance and adding information. This code is used only when it is the only code appropriate for the utterance. Utterances that are more behavior related and are not about the book and are not behaviors related to the book, should go in the Not Coding category. Eg. – You're in the cabinet now.

Elaborated Strategies (3)	
Name of Code	*Definition*
Adding Information Beyond the Book Examples: He's sad, he's hungry, he's bad, that's baby's happy, sad, happy, surprised, frustrated, hungry, upset, sleepy, shy Examples: He broke the vase. Look what he did. (on pages where picture does not show character doing specific action) – e.g. in the No David book – David is in the corner – there is a broken vase on the floor – it requires interpretation by parent to state that the character broke vase, or that he did something to result in sitting in the corner Now he got in trouble because he broke a vase. He was bad and he climbed up on the chair. That's bad.	This code can be used for statements or questions. It describes utterances where the caregiver is interpreting the events depicted in the book. It may include a judgment by the caregiver about the character, concepts, or objects. These may involve how a character is feeling. Some utterances may include or imply the words "I think…". It is different from Labeling since it involves another level of analysis. The caregiver goes beyond the information presented in the book to explain a concept or action to the child. It may link something in the book to a concept. This may involve use of words such as "because" or "since". It also includes caregiver utterances that immediately follow a child utterance and expands on what the child produced. This is different from Encouraging Attention or Continuing Interaction code because it involves adding information and caregiver production of at least part of child utterance.

Example of expanding: Child: Ball Caregiver: Red ball (Big ball) (His ball)	
Relating the Book to Child's Life Examples: You like chicken too. You have a ducky like that. Is that you? That's you. Is that what you do? Bigeyed baby like Child (name of child)	The caregiver identifies components of the book that are related to the child's own experiences. This might be comparing an object represented in the book to an item within the child's home. It might also involve relating an experience to the child's own actions and preferences. This code is used whenever noticed and "trumps" other codes.
Attributing Meaning to Child Action or Behavior Examples: You're teething, You're tired. Do you want that? Are you finished? (if said in response to something that child has done – otherwise this could just be Seeking Participation) You're excited	These utterances may be statements or questions. The caregiver verbally describes the action of the child NOT an action related to the book. This code is also used when the caregiver interprets an action or behavior of the child. It is *not coded* for negative statements or commands. This code is also used when caregivers use the words "like", "think", "feel", as a way to describe the child's mental state.

Additional Codes (1)	
Name	*Definition*
Using Book or Print Conventions Examples: reading the title of a book, reading the authors' names, saying "The End", asking child to turn the page, telling child how to interact with book, read it, "let's see what's next"	The caregiver uses language that discusses components of the book (e.g. author), conventions such as turning the page, or verbally discusses print concepts. This code can describe utterances where caregivers are discussing book sharing routines (e.g. read the book, noting the beginning or end of the book, indicating that the book conveys information). These utterances focus on early literacy or acquiring literacy.

Other Codes	
Name	*Definition*
Not Coding Said to other child in room: P %Shh [NOTCODING]. P %shh [NOTCODING]! Said to home visitor: P All done [NOTCODING]. P Okay [NOTCODING].	Utterances directed to some other adult or child, not the child participating in the study. Utterances that indicate the caregiver is done with the task. Utterances unrelated to the book task. NOTE – the following types of utterances are not included in analyses. Utterances that are interrupted or abandonned. Utterances that are mazed. Utterances that include at least one unintelligible word from the caregiver.

Coding System Additional Examples

Immediate Strategies (5)

1. Labeling (LABEL in transcript)

Look at the babies
He's laughing.
They're kissing.
The baby's crying.
Nightnight
He's getting cookies.
There's a ball.
He's got a ducky.
Chicken.
See the doggie?
Do you see the baby?
He's smiling.
He's eating.
He's taking a bath.
He's making noise.
He's making music
Nightnight
Is that the duck?
Messy
Clean

Dirty
So Big (name of a game)
Peekaboo.
Theend.
All done.
We're all done.
You're almost done.
Animal sounds (%meow %quack)
Sounds that label actions (%bang)
Reading the title of book
Reading author's name
Let's look at a book.
Let's look at another one.
Let's look ….
Let's see the…

Examples from Transcripts (not in consecutive sequence in the transcript):

P That baby has a basket on his head [LABEL].
P They/'re kiss/ing [LABEL].
P Goodnight [LABEL].
P Peekaboo [LABEL].
P All done [LABEL].

2. Seeking Participation (PARTICIPATION in transcript)

What's this?
Where's the ducky?
What's he doing?
What's going on?
What else?
What -Who- Where-Why-How- questions – CODE AS ELABORATED STRATEGY
(e.g Adding Information, etc.) IF APPROPRIATE
Are you all done?
All done?
Let's turn the page.
Let's read a book
Let's find out what happens.
Do you want to…
Do you like …
Commands:
You hold it
Turn the page
Kiss the baby

Requesting Repetition of a Sound or Word:
Say “ew”, say “ball”, etc.

Examples from Transcripts (not in consecutive sequence in the transcript):

P Say NoDavid [PARTICIPATION] [BOOK].

P What/'s he do/ing [PARTICIPATION]?

P Where/'s the boat [PARTICIPATION]?

P Show him to mommy [PARTICIPATION].

P Can we just finish the book [PARTICIPATION] [BOOK]?

P What/'s that [PARTICIPATION]?

P What/'s that baby do/ing [PARTICIPATION]?

P Say "byebye" BabyFaces [PARTICIPATION] [BOOK].

3. Providing Answer to Own Questions (ANSOWNQUES in transcript)

Caregiver answers a question that he/she (the caregiver) just asked. This seems to be a way of modeling the question-answer sequence as well as providing information in this format. Do NOT use this code if there is any type of child utterance after the caregiver question because it will be difficult to choose if it was an Answer to Own Question, or another code (Adding Info, or Labeling, etc.).

Example from Transcript:
P What/'s he do/ing [PARTICIPATION]?
P He/'s knock/ing the fish/s over [ANSOWNQUES].

P What/'s he do/ing [PARTICIPATION]?
P He/'s gonna fall [ANSOWNQUES].

Note: the following is a non-example – because of child utterance
P Where/'s his boat at [PARTICIPATION]?
C {xx} [UNINT] [POINT].
-1:00
P Yeah [ATTNCONTINUE].
P There/'s a boat [LABEL].

4. Using Prohibitions (PROHIBITION in transcript)

No and variations like Mhmh, Uhuh
Don't do that
Don't eat it
Don't rip it
Not in your mouth
Hold on
Wait a minute
Wait
You're not cooperating
Keep your hands off the book
Sit down

Example from Transcript (the utterances are not in consecutive sequence)

P No [PROHIBITION].

P You not allowed get/ing down yet [PROHIBITION].

P Because you have to sit here with me [PROHIBITION].

P Wait [PROHIBITION].

P You have to sit here with Mommy [PROHIBITION].

P No [PROHIBITION].

5. Encouraging Attention and Continuing Interaction (ATTNCONTINUE in transcript)

Look
Oh
Look here
Child's name
Come here
Uhoh
Oops
Here
Look at that.
See that?
See?
What?
We ready?
You know what?
Right?

Let's see.
Let's look.
Yes and variations: Yeah, Mhm, Uhhuh
Huh?
Hmm. OR Hmm?
Praise – Good job, very good
Some behavior management without negative meaning or restriction of behavior:
You can have it
Sound effects that are for attention – e.g. gasping (%Ah!), saying "Aw"
DOES NOT include sound effects that label the sound an animal makes or sound effects in place of an object – e.g. %Vroom is Labeling code
Is that a %meowmeow – Labeling code
Exact imitations of child vocalizations/words

Examples from Transcripts (not in consecutive sequence in the transcript):

P Ohmygoodness [ATTNCONTINUE].

P Yeah [ATTNCONTINUE].

P %Ah [ATTNCONTINUE].

P Look [ATTNCONTINUE].

P Yeah [ATTNCONTINUE].

P Good girl [ATTNCONTINUE].

Elaborated Strategies (3)

<u>1. Adding Information Beyond the Book (INFORMATION in the transcript)</u>

He's sad
That's baby's happy
He's hungry
Most utterances that contain the following words:
sad, happy, surprised, frustrated, hungry, upset, sleepy, shy
- if it is used within utterances that relate it to the child's life – then code Relating the Book to Child's Life,
OR – if it is more specific to the child's own emotions or state of being – and not really about the events in the book – code as Attributing Meaning

Interpreting Events or actions:
He broke the vase.

Look what he did. (on pages where picture does not show character doing specific action) – e.g. in the No David book – David is in the corner – there is a broken vase on the floor – it requires **interpretation** by parent to state that the character broke vase, or that he did something to result in sitting in the corner

Explaining Action or Pictures in the book:

Now he got in trouble because he broke a vase.
He was bad and he climbed up on the chair.
That's bad.

Expanding a child utterance:
Child: Ball
Caregiver: Red ball (Big ball) (His ball)

Examples from Transcripts (not in consecutive sequence in the transcript):

P He/'s bang/ing it on the pot/s to make a racket [INFORMATION].

P That/'s not really bad [INFORMATION].

P It/'s good food/s [INFORMATION].

P He like/3s greenbean/s [INFORMATION].

P That one right there just look/3s mad [INFORMATION].

P Sleepy baby [INFORMATION].

P Is that baby sleepy [INFORMATION]?

2. Relating the Book to Child's Life (RELATELIFE in the transcript)

This code is used whenever noticed and "trumps" other codes.

You like chicken too.
You have a ducky like that.
Is that you?
That's you.
Is that what you do?
Bigeyed baby like Child (name of child)

Examples from Transcripts (not in consecutive sequence in the transcript):

P That boy/'s get/ing in trouble just like you [RELATELIFE].

P Is that like brother [RELATELIFE]?

P One thing you don't like [RELATELIFE].
P A bath [RELATELIFE].
- note that these previous 2 utterances are in sequence – and so they are both referring to same thought – and both get same code

P Just like Child does [RELATELIFE].

P And then he get/3s put in a corner like Brother [RELATELIFE].

P You like baby/s [RELATELIFE].

3. Attributing Meaning to Child Action or Behavior (ATTRIBMEAN in the transcript)

- these are utterances where caregivers put words to child's actions or behaviors

- a way to describe the child's mental state or behavioral state

You're teething.
You're tired.
You're excited

Do you want that?
Are you finished? (If said in response to something that child has done – otherwise this could just be Seeking Participation)

Examples from Transcripts (not in consecutive sequence in the transcript):

P You ain't look/ing at that baby [ATTRIBMEAN].

P You want to close it {the book} [ATTRIBMEAN].

P You just wanna eat it [ATTRIBMEAN].

P Are you go/ing to yell at me [ATTRIBMEAN]?

P You don't want to play anymore [ATTRIBMEAN].

Additional Codes (1)

<u>Using Book or Print Conventions (BOOK in the transcript)</u>

- coded in addition to one of the Immediate or Elaborated Strategies

reading the title of a book
reading the authors' names
saying "The End" – usually transcribed in transcript as "theend".
asking child to turn the page - Turn the page.
telling child how to interact with book – we read books, we look at books
talking about actions related to book: open, close, turn
using words specific to book or print: book, picture, page, read, letters
reading any text on the front or back cover of the book
book orientation – upside down, turn it over,

Let's see what's next.
Let's see what happens.
Are you done looking at the book?

Utterances that contain the words:

- book
- picture
- page
- read
- theend

Examples from Transcripts (not in consecutive sequence in the transcript):

P We/'re gonna read a book [LABEL] [BOOK].

P We/'re gonna look at a book [LABEL] [BOOK].

P This is Babyfaces [LABEL] [BOOK].

P You wanna help me turn the page/s like you do in your other book [RELATELIFE] [BOOK]?

P Take it and turn it [PARTICIPATION] [BOOK].

P Turn the page [PARTICIPATION] [BOOK].

P You can/'t eat a book [PROHIBITION] [BOOK].

P You gotta read it [LABEL] [BOOK].

P You gotta look at it [LABEL] [BOOK].

P Say "byebye" BabyFaces [PARTICIPATION] [BOOK].

P NoDavid [LABEL] [BOOK].

P I gotta keep it open [LABEL] [BOOK].

P There/'s no word/s [LABEL] [BOOK].

P I can/'t read it to you [LABEL] [BOOK].

P It/'s just picture/s [LABEL] [BOOK].

Other Codes (1)

Not Coding (NOTCODING in the transcript)

- utterances not related to book task
- utterances said to individuals other than the target child

Said to another child in room:

P %Shh [NOTCODING].

P %shh [NOTCODING]!

Said to home visitor:

P All done [NOTCODING].

P Okay [NOTCODING].

Unrelated to book:

P I/'m sorry [NOTCODING].

APPENDIX B: HISTOGRAMS

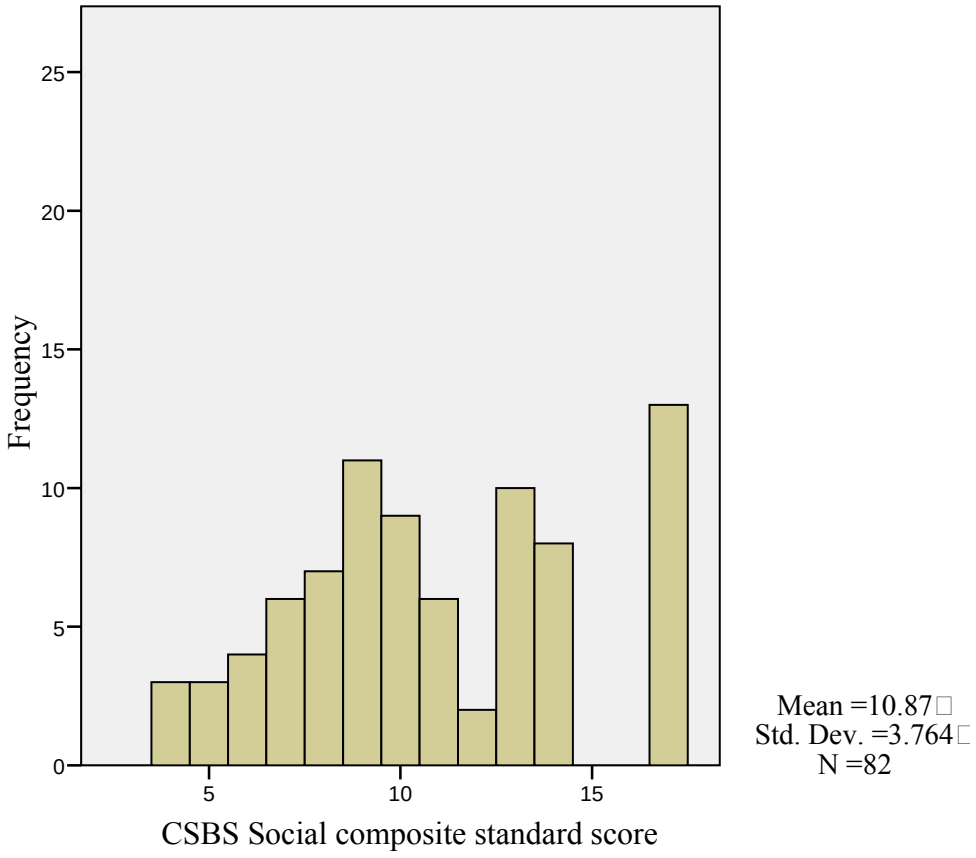

Figure B1. Histogram of *CSBS DP Infant-Toddler Checklist* Social Composite Standard Score

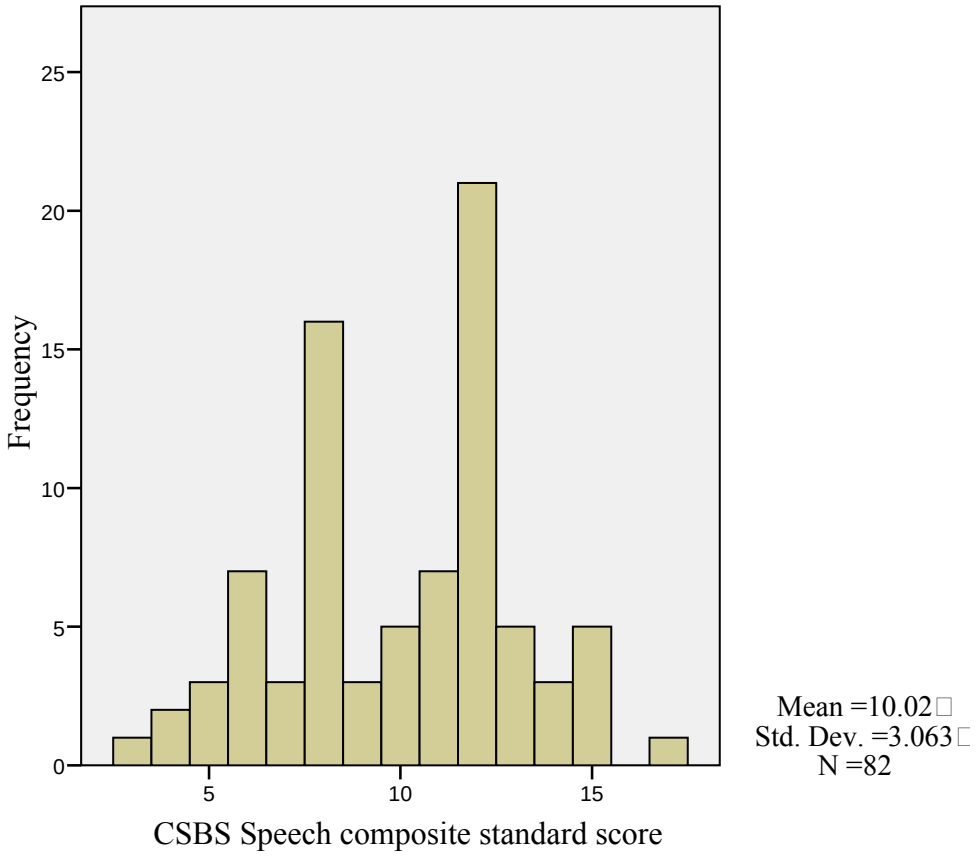

Figure B2. Histogram of *CSBS DP Infant-Toddler Checklist* Speech Composite Standard Score

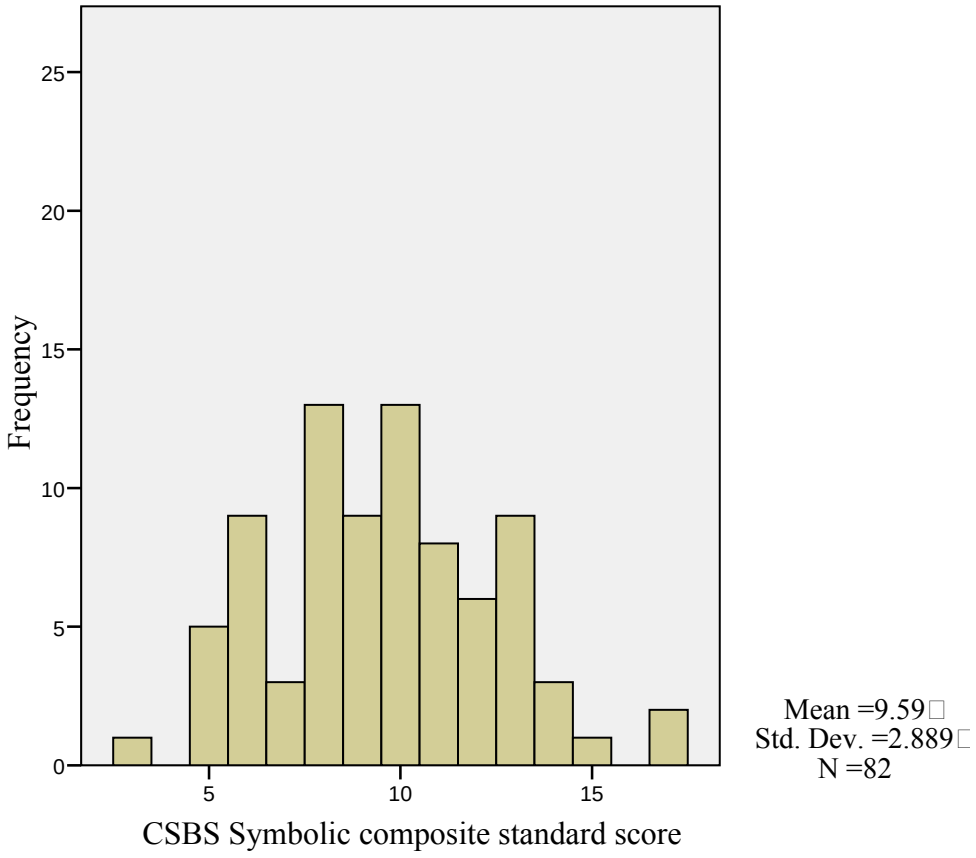

Figure B3. Histogram of *CSBS DP Infant-Toddler Checklist* Symbolic Composite Standard Score

REFERENCES

Anderson-Yockel, J., & Haynes, W. O. (1994). Joint book-reading strategies in working-class African American and White mother-toddler dyads. *Journal of Speech and Hearing Research, 37*, 583-593.

Baby Faces. (1998). New York: DK Publishing.

Bakeman, R., & Gottman, M. J. (1997). *Observing interaction: An introduction to sequential analysis* (2nd ed.). Cambridge: Cambridge University Press.

Barnes, S., Gutfreund, M., Satterly, D., & Wells, G. (1983). Characteristics of adult speech which predict children's language development. *Journal of Child Language, 10*(1), 65-84.

Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21*(3), 205-226.

Baumwell, L., Tamis-LeMonda, C., & Bornstein, M. (1997). Maternal verbal sensitivity and child language comprehension. *Infant Behavior and Development, 20*(2), 247-258.

Bee, H. L., Barnard, K. E., Eyres, S. J., Gray, C. A., Hammond, M. A., Spietz, A. L., et al. (1982). Prediction of IQ and language skill from perinatal status, child performance family characteristics, and mother-infant interaction. *Child Development, 53*(1133-1156).

Blank, M., Rose, S., & Berlin, L. J. (1978). *The language of learning: The preschool years*. New York: Grune & Stratton.

Bloom, L. (1973). *One word at a time: The use of single word utterances before syntax*. The Hauge: Mouton & Co.

Borenstein, M, Rothstein, H., & Cohen, J. (2001) Power and Precision [Computer software]. Englewood, NJ: Biostat.

Bornstein, M., & Haynes, O. M. (1998). Vocabulary competence in early childhood: Measurement, latent construct, and predictive validity. *Child Development, 69*(3), 654-671.

Bornstein, M., Haynes, O. M., & Painter, K. (1998). Sources of child vocabulary competence: A multivariate model. *Journal of Child Language, 25*, 367-393.

Bornstein, M., Tamis-LeMonda, C., & Haynes, O. M. (1999). First words in the second year: Continuity, stability, and models of concurrent and predictive correspondence in vocabulary and verbal responsiveness across age and context. *Infant Behavior & Development, 22*(1), 65-85.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon & R. M. Lerner (Eds.), *Handbook of Child Psychology (5th Ed.): Theoretical models of human development* (pp. 993-1028). New York: Wiley.

Bruner, J. S. (1974/1975). From communication to language-A psychological perspective. *Cognition, 3*(3), 255-287.

Bruner, J. S. (1975). The ontogenesis of speech acts. *Journal of Child Language, 2*(1), 1-19.

Bruner, J. S. (1981). The social context of language acquisition. *Language & Communication, 1*(2/3), 155-178.

Bus, A. G., van IJzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on the intergenerational transmission of literacy. *Review of Educational Research, 65*(1), 1-21.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development, 63*(4, Serial No. 255).

Carpenter, R. L., Mastergeorge, A. M., & Coggins, T. E. (1983). The acquisition of communicative intentions in infants eight to fifteen months of age. *Language and Speech, 26*(2), 101-116.

Catts, H., Fey, M., Tomblin, J. B., & Zhang, X. (2002). A longitudinal investigation of reading outcomes in children with language impairments. *Journal of Speech, Language, and Hearing Research, 45*, 1142-1157.

Chall, J., & Dale, E. (1995). *Readability revisited and the new Dale-Chall readability formula*. Cambridge: Brookline Books.

Chapman, R. S. (2000). Children's language learning: An interactionist perspective. *Journal of Child Psychology and Psychiatry, 41*(1), 33-54.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 20*, 37-46.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Crain-Thoreson, C., Dahlin, M. P., & Powell, T. A. (2001). Parent-child interaction in three conversational contexts: Variations in style and strategy. *New Directions for Child and Adolescent Development, 92*(Summer 2001), 23-37.

Crain-Thoreson, C., & Dale, P. (1992). Do early talkers become early readers? Linguistic precocity, preschool language, and emergent literacy. *Developmental Psychology, 28*(3), 421-429.

Crais, E., Douglas, D., & Campbell, C. (2004). The intersection of the development of gestures and intentionality. *Journal of Speech, Language, and Hearing Research, 47*, 678-694.

Dearing, E., McCartney, K., & Taylor, B. A. (2001). Change in family income-to-needs matters more for children with less. *Child Development, 72*(6), 1779-1793.

DeLoache, J. S., & DeMendoza, O. (1987). Joint picturebook interactions of mothers and 1-year-old children. *British Journal of Developmental Psychology, 5*, 111-123.

DeTemple, J. M. (2001). Parents and children reading books together. In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and school* (pp. 31-51; 353-355). Baltimore: Paul H. Brookes.

Dollaghan, C. A., Campbell, T. F., Paradise, J. K., Feldman, H. M., Janosky, J. E., Pitcairn, D. N., et al. (1999). Maternal education and measures of early speech and language. *Journal of Speech, Language, and Hearing Research, 42*, 1432-1443.

Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development, 65*, 296-318.

Duncan, G. J., & Brooks-Gunn, J. (2000). Family poverty, welfare reform, and child development. *Child Development, 71*(1), 188-196.

Evans, G. W. (2004). The environment of childhood poverty. *American Psychologist, 59*(2), 77-92.

Evans, G. W., Gonnella, C., Marcynyszyn, L. A., Gentile Lauren, & Salpekar, N. (2005). The role of chaos in poverty and children's socioemotional adjustment. *Psychological Science, 16*(7), 560-565.

Fenson, L., Dale, P., Reznick, J. S., Thal, D. J., Bates, E., Hartung, J., et al. (1993). *MacArthur Communicative Development Inventories (CDI)*. San Diego, CA: Singular Publishing Group.

Fewell, R., & Deutscher, B. (2004). Contributions of early language and maternal facilitation variables to later language and reading abilities. *Journal of Early Intervention, 26*(2), 132-145.

Fish, M., & Pinkerman, B. (2003). Language skills in low-SES rural Appalachian children: normative development and individual differences, infancy to preschool. *Applied Developmental Psychology, 23*, 539-565.

Fleiss, J. L. (1981). *Statistical methods for rates and proportions* (2nd ed.). New York: John Wiley & Sons.

Hardy-Brown, K., & Plomin, R. (1985). Infant communicative development: Evidence from adoptive and biological families for genetic and environmental influences on rate differences. *Developmental Psychology, 21*(2), 378-385.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: P. H. Brookes.

Heath, S. B. (1982). What no bedtime story means: Narrative skills at home and school. *Language in Society, 11*, 49-76.

Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. Cambridge, England: Cambridge University Press.

Hockenberger, E. H., Goldstein, H., & Haas, L. S. (1999). Effects of commenting during joint book reading by mothers with low SES. *Topics in Early Childhood Special Education, 19*(1), 15-27.

Hoff-Ginsberg, E. (1986). Function and structure in maternal speech: Their relation to the child's development of syntax. *Developmental Psychology, 22*(2), 155-163.

Hoff-Ginsberg, E. (1991). Mother-child conversation in different social classes and communicative settings. *Child Development, 62*, 782-796.

Hoff-Ginsberg, E. (1992). How should frequency in input be measured. *First Language, 12*, 233-244.

Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development, 74*(5), 1368-1378.

Hoff, E., Laursen, B., & Tardif, T. (2002). Socioeconomic status and parenting. In M. H. Bornstein (Ed.), *Handbook of parenting: Ecology and Biology of Parenting* (2 ed., Vol. 2, pp. 231-252). Mahwah, NJ: Lawrence Erlbaum.

Hoff, E., & Naigles, L. (2002). How children use input to acquire a lexicon. *Child Development, 73*(2), 418-433.

Huberty, C. J. (1994). *Applied discriminant analysis*. New York: John Wiley & Sons.

Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: Relation to language input and gender. *Developmental Psychology, 27*(2), 236-248.

Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Cognitive Psychology, 45*, 337-374.

Justice, L. M., & Ezell, H. K. (2002). Use of storybook reading to increase print awareness in at-risk children. *American Journal of Speech-Language Pathology, 11*, 17–29.

Justice, L. M., Mattingly, S., Ezell, H. K., & Bakeman, R. (2002). A sequential analysis of children's responsiveness to parental references to print during shared storybook reading. *American Journal of Speech-Language Pathology, 11*, 30–40.

Karrass, J., Braungart-Rieker, J. M., Mullings, J., & Lefever, J. B. (2002). Processes in language acquisition: The roles of gender, attention, and maternal encouragement of attention over time. *Journal of Child Language, 29*, 519-543.

Kavanaugh, J., & Jirkovsky, A. (1982). Parental speech to young children: A longitudinal analysis. *Merrill-Palmer Quarterly, 28*(2), 297-311.

Kloth, S., Janssen, P., Kraaimaat, F., & Brutten, G. J. (1998). Communicative styles of mothers interacting with their preschool-age children: a factor analytic study. *Journal of Child Language, 25*, 149-168.

Lee, V., & Burkam, D. (2002). *Inequality at the starting gate: Social background differences in achievement as children begin school*. Washington, D.C.: Economic Policy Institute.

Mannle, S., Barton, M., & Tomasello, M. (1991). Two-year olds' conversations with their mothers and preschool-aged siblings. *First Language, 12*, 57-71.

Martin, L. E. (1998). Early book reading: How mothers deviate from printed text for young children. *Reading Research and Instruction, 37*, 137-160.

Martin, L. E., & Reutzel, R. (1999). Examining how and why mothers deviate from the print. *Reading Research and Instruction, 39*(1), 39-69.

Masur, E. F., Flynn, V., & Eichorst, D. L. (2005). Maternal responsive and directive behaviours and utterances as predictors of children's lexical development. *Journal of Child Language, 32*, 63-91.

McLean, L. (1990). Communication development in the first two years of life: A transactional process. *Zero to Three, September*, 13-19.

McLoyd, V. C. (1990). The impact of economic hardship on black families and children: Psychological distress parenting and socioemotional development. *Child Development, 61*, 311-346.

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist, 53*(2), 185-204.

Miller, J.R., & Chapman, R.S. (2004). *Systematic Analysis of Language Transcripts (SALT)*, Version 8 (Windows) [Computer software]. Language Analysis Laboratory, Waisman Center on Mental Retardation and Human Development, University of Wisconsin at Madison.

NICHD Early Child Care Research Network. (2005a). Pathways to reading: The role of oral language in the transition to reading. *Developmental Psychology, 41*(2), 428-442.

NICHD Early Child Care Research Network. (2005b). Duration and developmental timing of poverty and children's cognitive and social development from birth through third grade. *Child Development, 76*(4), 795-810.

National Center for Children in Poverty. (2006). *Low-income children in the United States: National and state trend data, 1995-2005.* Retrieved October 15, 2006, from http://www.nccp.org/pub_nst06a.html

Ninio, A. (1980). Picture-book reading in mother-infant dyads belonging to two subgroups in Israel. *Child Development, 51*, 587-590.

Ninio, A. (1983). Joint book reading as a multiple vocabulary acquisition device. *Developmental Psychology, 19*(3), 445-451.

Ninio, A., & Bruner, J. S. (1978). The achievement and antecedents of labelling. *Journal of Child Language, 5*, 1-15.

O'Hare, W. P., & Johnson, K. M. (2004). *Child poverty in rural America*: Population Reference Bureau: Reports on America, 4(1).

Pan, B., Rowe, M., Singer, J., & Snow, C. E. (2005). Maternal correlates of growth in toddler vocabulary production in low-income families. *Child Development, 76*(4), 763-782.

Pellegrini, A. D., Brody, G. H., & Sigel, I. E. (1985). Parents' book-reading habits with their children. *Journal of Educational Psychology, 77*(3), 332-340.

Pellegrini, A. D., Perlmutter, J. C., Galda, L., & Brody, G. H. (1990). Joint reading between Black Head Start children and their mothers. *Child Development, 61*, 443-453.

Peterson, C., Jesso, B., & McCabe, A. (1999). Encouraging narratives in preschoolers: An intervention study. *Journal of Child Language, 26*, 49-67.

Price, L. H. & van Kleeck, A. (in preparation). Consistency in parents' extratextual talk during book sharing with preschoolers: What difference does more data make?

Recruitment Summary (n.d.). Retrieved February 2, 2007, from http://www.fpg.unc.edu/~flp/papers.cfm.

Roberts, J., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of Speech, Language, and Hearing Research, 48*, 345-359.

Rogoff, B. (1990). *Apprenticeship in thinking*. New York: Oxford University Press.

Rollins, P. R. (2003). Caregivers' contingent comments to 9-month-old infants: Relationships with later language. *Applied Psycholinguistics, 24*(2), 221-234.

Rowe, M., Pan, B., & Ayoub, C. (2005). Predictors of variation in maternal talk to children: A longitudinal study of low-income families. *Parenting: Science and Practice, 5*, 285-310.

Sameroff, A. J., & MacKenzie, M. J. (2003). Research strategies for capturing transactional models of development: The limits of the possible. *Development and Psychopathology, 15*, 613-640.

Sénéchal, M. (1997). The differential effect of storybook reading on preschoolers' acquisition of expressive and receptive vocabulary. *Journal of Child Language, 24*, 123-138.

Sénéchal, M., Cornell, E. H., & Broda, L. (1995). Age-related differences in the organization of the parent-infant interactions during picture-book reading. *Early Childhood Research Quarterly, 10*, 317-337.

Sénéchal, M., LeFevre, J. A., Thomas, E. M., & Daley, K. E. (1998). Differential effects of home literacy experiences on the development of oral and written language. *Reading Research Quarterly, 33*(1), 96-116.

Shannon, D. (1998). *No, David!* New York: Scholastic.

Snow, C. E. (1972). Mothers' speech to children learning language. *Child Development, 43*, 549-565.

Snow, C. E. (1991). The theoretical basis for relationships between language and literacy in development. *Journal of Research in Childhood Education, 6*(1), 5-10.

Snow, C. E., Arlman-Rupp, A., Hassing, Y., Jobse, J., Joosten, J., & Vorster, J. (1976). Mothers' speech in three social classes. *Journal of Psycholinguistic Research, 5*(1), 1-20.

Snow, C. E., Barnes, W., Chandler, J., Goodman, I., & Hemphill, L. (1991). *Unfulfilled expectations: Home and school influences on literacy*. Cambridge, MA: Harvard University Press.

Snow, C. E., & Goldfield, B. A. (1983). Turn the page please: situation-specific language acquisition. *Journal of Child Language, 10*, 551-569.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*, 360-407.

Stoel-Gammon, C. (1998). Role of babbling and phonology in early linguistic development. In A. M. Wetherby, S. F. Warren & J. Reichle (Eds.), *Transitions in Prelinguistic Communication* (Vol. 7, pp. 87-110). Baltimore: Paul H. Brookes.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn and Bacon.

Tabors, P. O., Beals, D. E., & Weizman, Z. O. (2001). "You know what oxygen is?": Learning new words at home. In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and school* (pp. 93-110; 362-365). Baltimore: Paul H. Brookes.

Tabors, P. O., Roach, K. A., & Snow, C. E. (2001). Home language and literacy environment: Final results. In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and school* (pp. 111-138). Baltimore, MD: Paul H. Brookes.

Tamis-LeMonda, C., Bornstein, M., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development, 72*(3), 748-767.

Tizard, B., & Hughes, M. (1984). *Young children learning*. Cambridge, MA: Harvard University Press.

Tomasello, M., & Farrar, M. J. (1986). Joint attention and early language. *Child Development, 57*, 1454-1463.

U.S. Census Bureau (October, 2006). *Current Population Survey, 2005 Annual Social and Economic Supplement*. Retrieved February 23, 2007, from http://www.census.gov/population/www/socdemo/education/cps2005.html

van Kleeck, A. (2003). Research on book sharing: Another critical look. In A. van Kleeck, S. Stahl & E. B. Bauer (Eds.), *On reading books to children: Parents and teachers* (pp. 271-320). Mahwah: Lawrence Erlbaum Associates, Inc.

van Kleeck, A., Alexander, E. I., Vigil, A., & Templeton, K. E. (1996). Verbally modeling thinking for infants: Middle-class mothers' presentation of information structures during book sharing. *Journal of Research in Childhood Education, 10*(2), 101-113.

van Kleeck, A., & Beckley-McCall, A. (2002). A comparison of mothers' individual and simultaneous book sharing with preschool siblings: An exploratory study of five families. *American Journal of Speech-Language Pathology, 11*, 175-189.

van Kleeck, A., Gillam, R. B., Hamilton, L., & McGrath, C. (1997). The relationship between middle-class parents' book-sharing discussion and their preschoolers' abstract language development. *Journal of Speech, Language, and Hearing Research, 40*, 1261-1271.

Vernon-Feagans, L. (1996). *Children's talk in communities and classrooms*. Cambridge, MA: Blackwell Publishers.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Weizman, Z. O., & Snow, C. E. (2001). Lexical input as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology, 37*(2), 265-279.

Wetherby, A. M., Cain, D. H., Yonclas, D. G., & Walker, V. G. (1988). Analysis of intentional communication of normal children from the prelinguistic to the multiword stage. *Journal of Speech and Hearing Research, 31*, 240-252.

Wetherby, A. M., & Prizant, B. M. (1989). The expression of communicative intent: Assessment guidelines. *Seminars in Speech and Language, 10*(1), 77-91.

Wetherby, A., & Prizant, B. (2002). Communication and Symbolic Behavior Scales Developmental Profile (CSBS DP). Baltimore: Paul. H. Brookes.

Whitehurst, G. J., Arnold, D. S., Epstein, J. N., Angell, A. L., Smith, M., & Fischel, J. E. (1994). A picture book reading intervention in day care and home for children from low-income families. *Developmental Psychology, 30*(5), 679-689.

Whitehurst, G. J., Falco, F. L., Lonigan, C. J., Fischel, J. E., DeBaryshe, B. D., Valdez-Menchaca, M. C., et al. (1988). Accelerating language development through picture book reading. *Developmental Psychology, 24*(4), 552-559.

Yoder, P. J., McCathren, R. B., Warren, S. F., & Watson, A. L. (2001). Important distinctions in measuring maternal responses to communication in prelinguistic children with disabilities. *Communication Disorders Quarterly, 22*(3), 135-147.

Yoder, P. J., Warren, S. F., Kim, K., & Gazdag, G. E. (1994). Facilitating prelinguistic communication skills in young children with developmental delay II: Systematic replication and extension. *Journal of Speech and Hearing Research, 27*, 841-851.

Yont, K. M., Snow, C. E., & Vernon-Feagans. (2003). The role of context in mother-child interactions: An analysis of communicative intents expressed during toy play and book reading with 12-month olds. *Journal of Pragmatics, 35*, 435-454